JANUARY 9, 1936

THE IRON AGE

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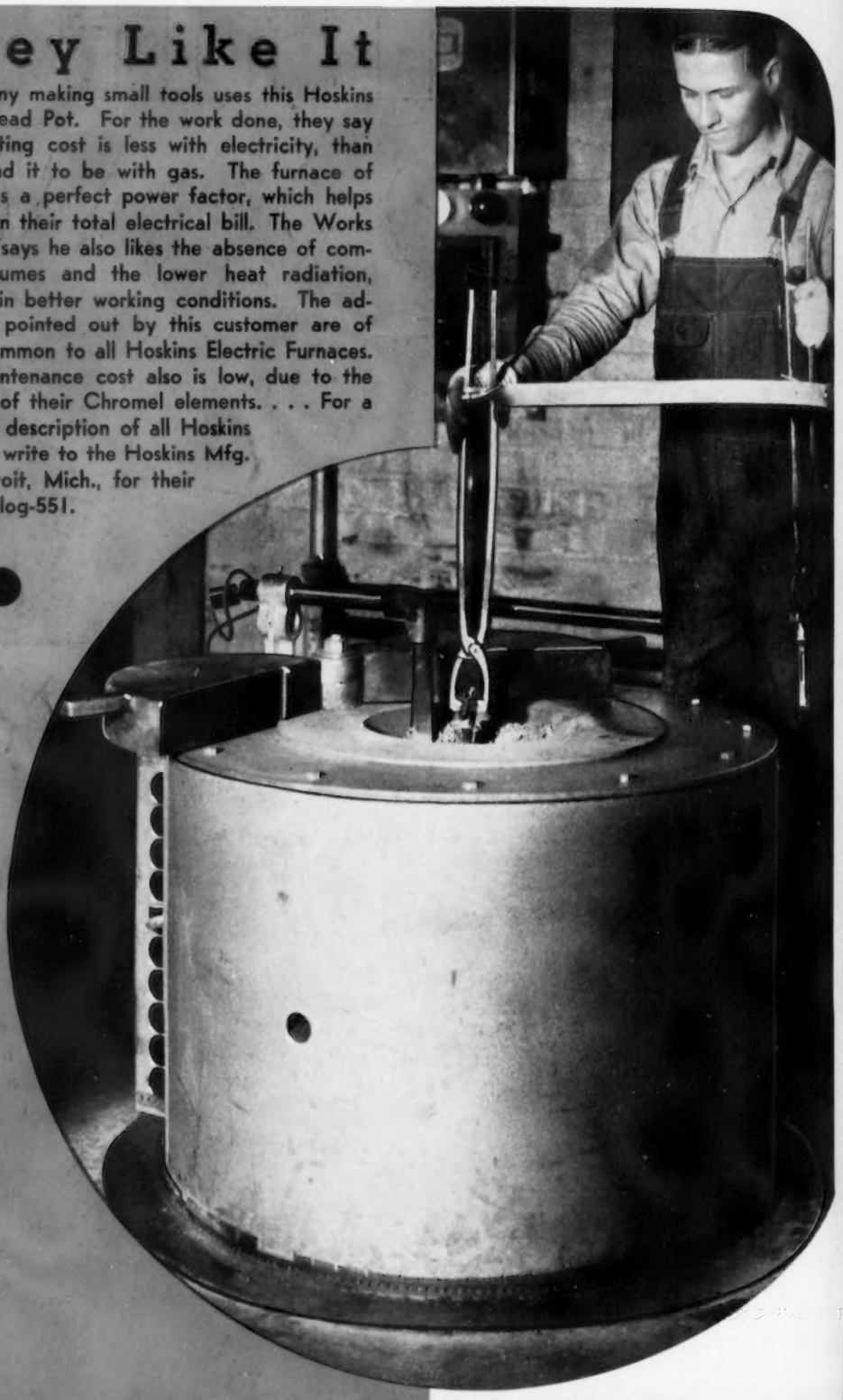

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THE IRON AGE

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JANUARY 9, 1936

ESTABLISHED 1855 Vol. 137, No. 2

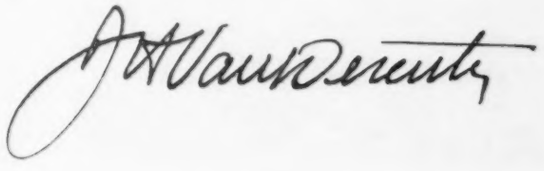
We Bow to the Postman

LARGE as was the Annual Review Number of THE IRON AGE which you received last week, it lacked sufficient space for completing the presentation of several text articles. There is a limit, as you know, to the weight that a postman can carry without becoming stoop-shouldered.

So, in this succeeding issue, we are completing the technical reviews which were begun in the Annual. We advise therefore that you regard this number, editorially, as a companion issue to our first of the year number and that you preserve it for the coming 12 months as a reference book.

Such has become the habit among many IRON AGE readers. And we feel that this year there is more reason for doing so than ever. For in these two issues are to be found information that should be of value throughout the whole of the coming year to every man in the metal-working industry who has either commercial or technical responsibilities.

Nowhere else, we believe, can one obtain a more complete, up-to-the-minute picture of what has happened in 1935 in every branch of our great metal-working industry. It should be a valuable guide book for making both corporate and personal plans for 1936. We say this with sincerity, because we believe it to be true and our one desire is to have each one of you profit to the utmost by that which we have placed in your hands.



Recent Developments in S

AN application of sintered tungsten carbide differing from the usual run is illustrated in Fig. 29 which shows a Firthite-tipped multiple diameter combination core drill and counterbore. The use of a tool such as this one enables two cuts to be performed at one time; makes possible a substantial increase in output per machine; and reduces the overall tool cost per piece due to higher tool life. The set-up in Fig. 30 shows two Firthite tipped inserted-blade milling cutters in a Milwaukee milling machine finishing the top and bottom faces of a cast iron refrigerator compressor. On work of this kind, when using tungsten carbide, the amount of material to be removed is usually reduced to a minimum because the hardness of Firthite is not affected by the abrasiveness of scale as would be other tools. With former high-speed cutters the table feed was 12-in. per min. but the finish was not as smooth as required. Applying the carbide equipped cutters enabled the table feed to be increased to 32-in. per min., resulting in a substantial increase in output. On account of the high cutting speed used, which is approximately 275 ft. per min., the surface is milled exceptionally smooth and far more accurately than before.

These two examples are representative of the gains that avail themselves by the use of tungsten carbide, which include increased outputs, longer tool life, less tool cost, a saving in material, combining of two or more cuts into one, better and smoother finishes, greater accuracy and a reduction in spoiled work.

Firthite Tools

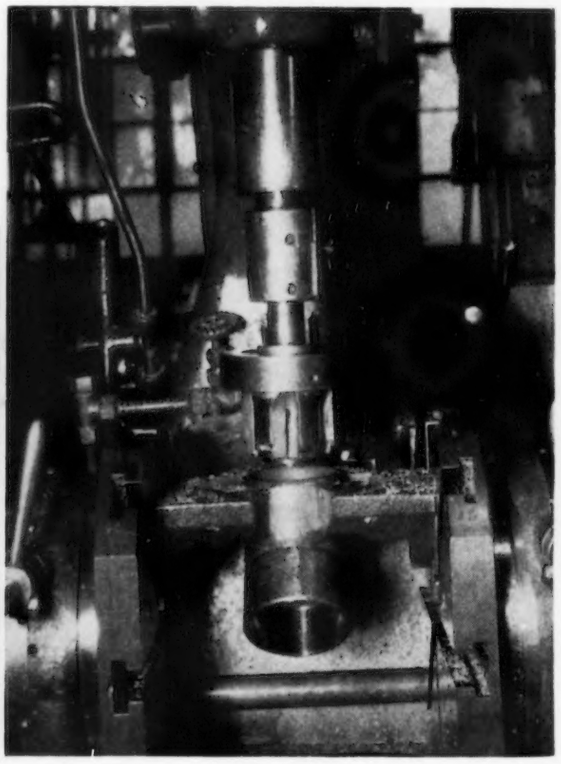
Other metal-cutting operations that are representative of the use

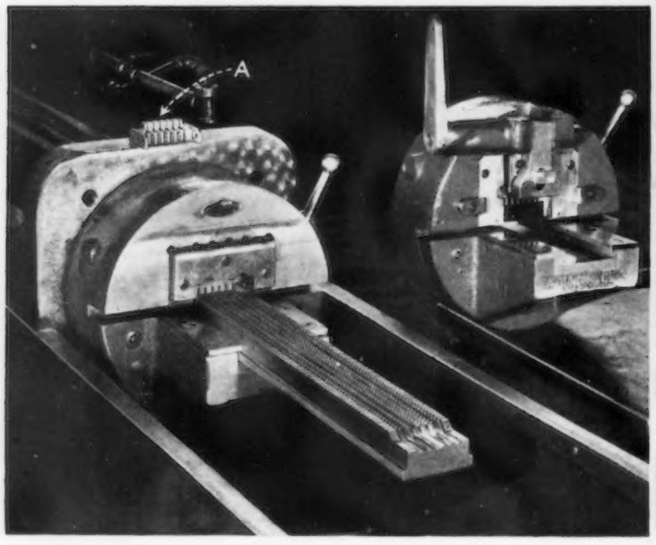
AT RIGHT

FIG. 29—A combination tool for boring and facing a bronze casting. The teeth are tipped with tungsten carbide cutting edge.

BELOW

FIG. 28—A series of slots and adjoining surfaces are finished simultaneously in this machine by an Ex-Cell-O sectional-type high-speed steel broach.





in Small Tools ▲ ▲ ▲

By FRANK W. CURTIS
Manager, Firthite Division, Firth-Sterling Steel Co.

Concluded from the ANNUAL REVIEW NUMBER

of Firthite are shown. Fig. 31 shows a large chilled cast-iron frame being machined in a vertical boring mill. With former tools it was practically impossible to finish a single surface without the necessity of resharpening the tool, but with tungsten carbide several complete castings are machined between grinds. This type of performance is quite common, especially in view of the many newer types of metals which have been introduced, some of which are extremely hard and tough. In fact, in some instances metallurgists have developed materials of an entirely different structure, knowing that machining is now possible with tungsten carbide tools.

A completely tooled J. & L. lathe set-up for the machining of aluminum-alloy pistons is illustrated in Fig. 32. The abrasiveness of aluminum, which is often detrimental to other cutting materials, has little effect on tungsten carbide, which has resulted in a very pronounced use of these super-hard tools on this class of work. The operation shown includes rough and finish turning, grooving and facing, which are done at a speed of approximately 700 ft. per min. Complete pistons are turned out at the rate of 2 pieces per min.

An example representative of a production increase of more than 100 per cent is shown in Fig. 33. The operation is that of machining a multiple-grooved elevator sheave which is rough turned at a speed of approximately 200 ft. per min. and grooved at more than 100 ft. per min.

An excellent set-up showing the use of multiple tungsten carbide tools is illustrated in Fig. 34 representing the rough and finish turning and grooving of a dog

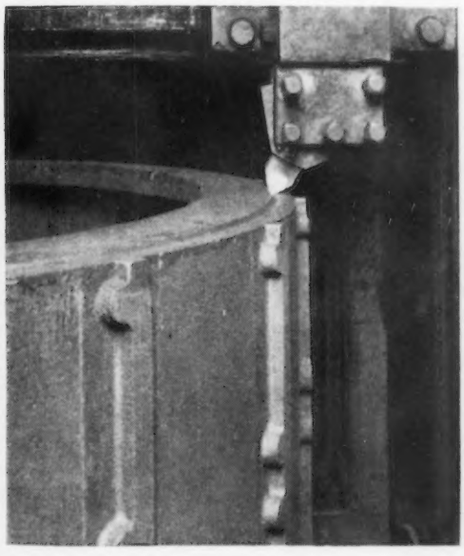
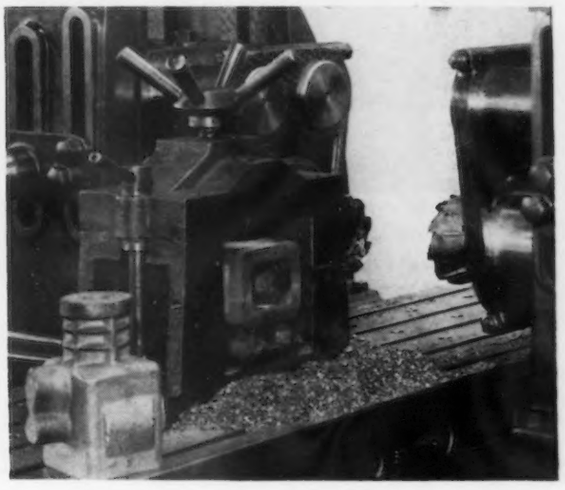


FIG. 31—A Firthite tool cutting a chilled iron casting that could not be economically machined with the usual type of steel tool.

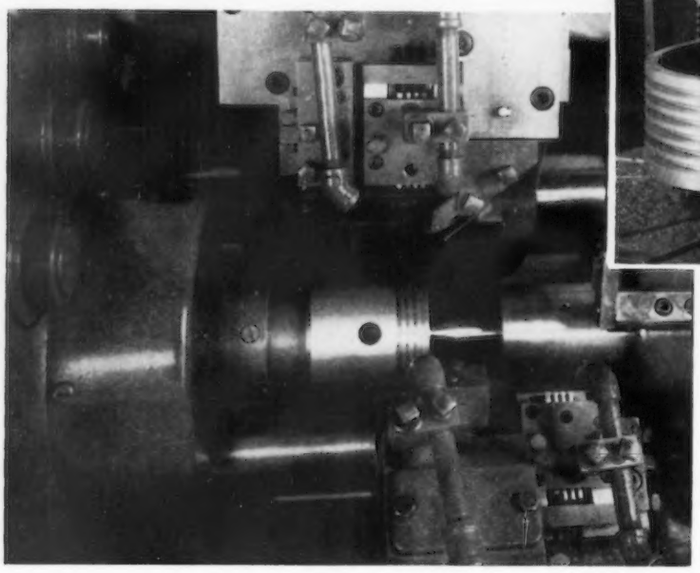
BELOW

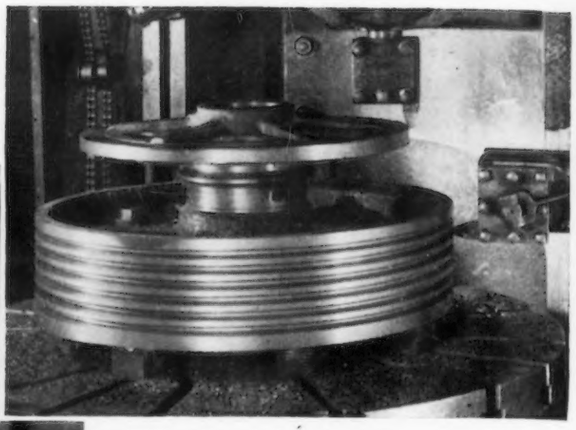
FIG. 30—Milling is effectively handled by tungsten-carbide equipped milling cutters. This operation is handled at a speed of 275 ft. per minute and a feed of 32 in. per minute.



BELOW

FIG. 32—The machining of aluminum is exceptionally well handled by tungsten carbide, especially when the silicon content is high.





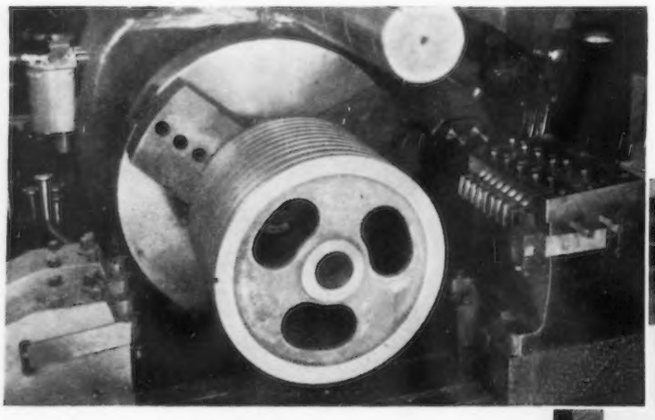
ABOVE

FIG. 33—The use of Firthite on this operation, turning, facing and grooving elevator sheaves, has enabled a substantial increase in output.

o o o

drum in a Potter & Johnson automatic turret lathe using Firthite tools. The rough turning is performed at 175 ft. per min. using a feed of approximately 1/32-in. Ten grooving tools feed into the work from the rear simultaneously and operate at a speed of 300 ft. a min. The operation is completed in 10 min. and requires the removal of 85 lb. of material.

An excellent example of the possibilities of tungsten carbide milling is shown in Fig. 35 which shows the finishing of a large machine casting which requires finishing around the rim and step milling of several bosses and pads located at the center, as well as opposite side pads. Most of the machining is completed at a speed of 270 ft. a min., removing 3/16 to ¼-in. of metal, and with a table feed of 17 to 25 in. per min. When milling around the rim, the depth of cut on a casting of this size is likely to vary, so that the operator uses his judgment in either increasing or decreasing the speed as may be required. A complete casting is finished in 40 min., as compared to a former time of almost 2 hr. The operation is per-



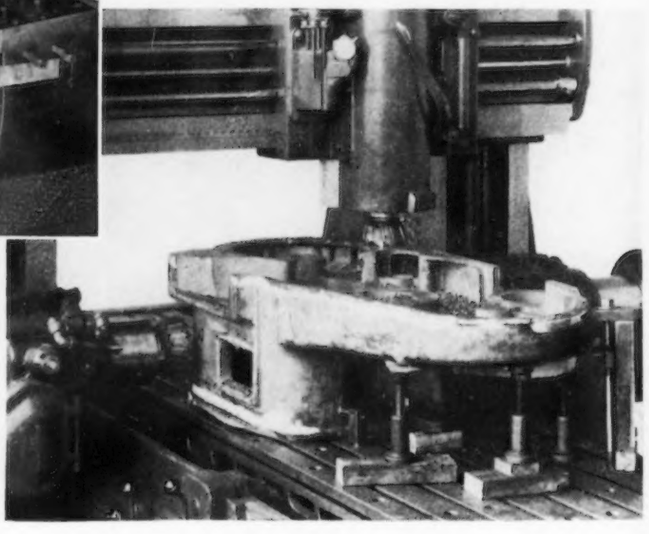
ABOVE

FIG. 34—On this job, which is the machining of a large dog drum, a total of 85 lb. of material is removed in 10 minutes. Ten grooving tools cut grooves 7/8 in. deep at one time.

o o o

BELOW

FIG. 35—Milling the rim and several pads at different heights on this large machine casting is done by a Firthite-tipped cutter in less then half the time formerly needed.



formed in a Milwaukee rail-type milling machine.

The variety of Firthite-tipped tools shown in Fig. 36 include a core drill, a skiving tool, interlocking cutters and a lathe center. The core drill has a removable end which can be replaced after it has worn beyond further use. The skiving tool is representative of the length of a tungsten-carbide insert which can be successfully applied to a single shank. In this case the tool is used for forming a plumbing fixture. The Firthite insert is 10½ in. in length and is made in three separate sections, butted closely together. The cutting edge is made angular so that only one portion of the tool is cutting at one time. The interlocking cutters shown represent a somewhat new development in the application of tungsten carbide. While tungsten carbide slab cutters are not used generally, they can be applied to certain classes of work where cutting qualities are previously determined.

Below may be seen a tungsten-carbide tipped lathe center. The demand for such centers as a result of operating achievements is increasing considerably. These centers are used for both roughing and finishing operations. The long life and exceedingly small amount of wear aid in the maintenance of accuracy on such jobs where limits are important.

Diamond Wheels

Paralleling the industrial trend to reduce manufacturing costs, the introduction of diamond wheels for grinding tungsten carbide tools is an important advancement that has resulted in substantial economies. Generally speaking, the sharpening of tipped tools can be completed in a fraction of the time formerly required with silicon or vitrified bonded wheels, whether off-hand or machine-ground methods are used.

Diamond wheels, developed by Carborundum and Norton, furnished in a large variety of styles and shapes, consist of a molded composition center to which a thin rim of crushed and screened diamonds is bonded to the cutting face. The wear-resisting value of the diamond rim and its free-cutting action result in far greater accuracy, which is important to tungsten carbide tools. Moreover, the finish is so improved that tools formerly requiring lapping can now be completed in one operation by diamond wheel grinding.

The sharpening of a grooving tool is quite representative of the economies of the diamond wheel. Heretofore, rough and finish grinding and lapping operations were needed to finish the tool to width within a few tenths. Now, with a diamond wheel, the same tool can be ground in but one operation. Another example of economy is the sharpening of an inserted-blade milling cutter. The faces of the blades must be true within 0.0005 in. in order to produce a smooth milled finish which has not always been an easy undertaking with present-day grinding equipment and the former style abrasive wheel, but extreme accuracy in a relatively short time is now possible with the diamond wheel. This is due to the free-cutting qualities of diamonds and the fact that wheel wear is almost negligible. In taking a final pass around the blades of a cutter, there is not apparent wear, so that uniformity becomes a simple undertaking.

Diamond wheels are furnished in grain sizes from 100 to 400. The 100-grain wheel is suited to a large majority of tungsten carbide tools and is used especially where the fast removal of stock is required. A grain of 180 or 220 is more for general-purpose grinding, while the 400 grain wheel is intended for smaller tools where an ultra-fine cutting edge is required.

The use of a diamond wheel for off-hand grinding of tungsten carbide tools in an Ex-Cell-O tool grinder developed especially for this class of work is illustrated in Fig. 37. A double-end spindle is provided to enable the use of a rough wheel on one side and a finishing wheel on the opposite side. Machines of this kind are

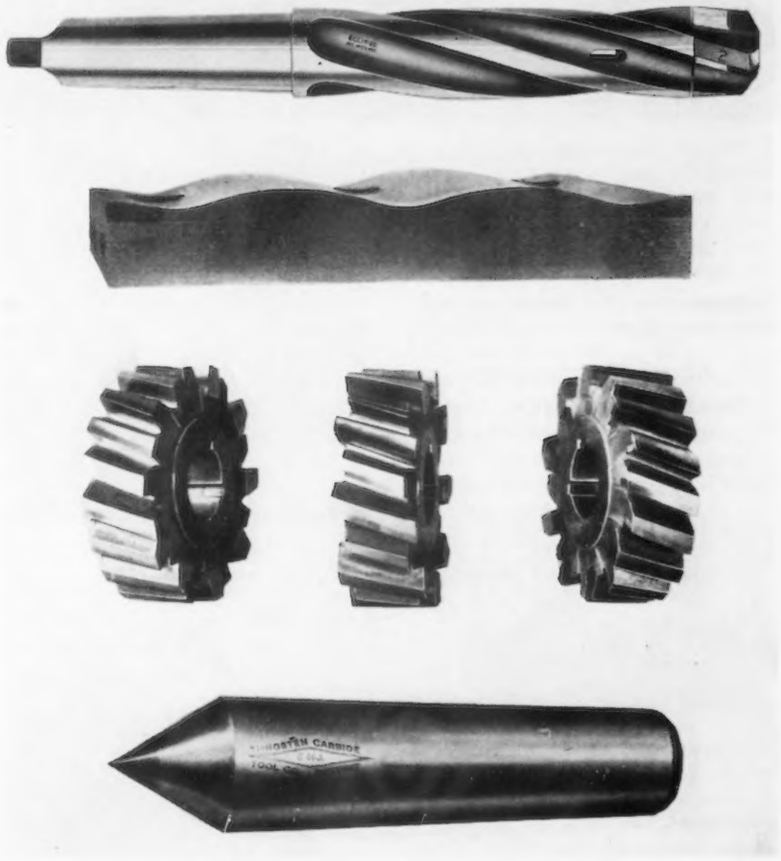


FIG. 36—A variety of tungsten carbide tools which are representative of some of the applications to which this material can be used. An Eclipse core drill, Ex-Cell-O interlocking slab cutters, a Firthite skiving tool and a Mitco lathe center.

FIG. 37—Diamond wheels for sharpening tungsten carbide tools have proven unusually successful since a keener sharper cutting edge can be produced in a fraction of the time needed heretofore.

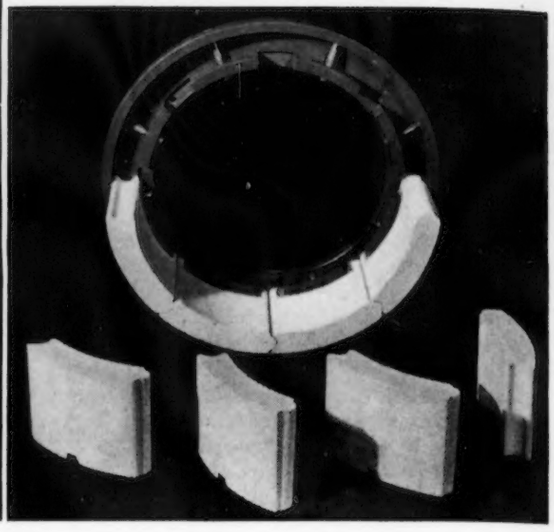


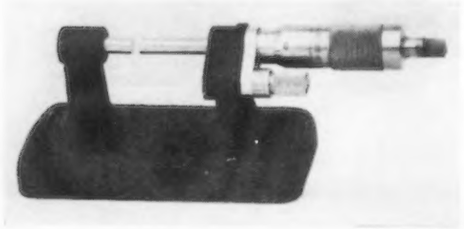
FIG. 38—A Sterling segmental-type abrasive wheel and chuck in which the segments are held by mechanical means.

indispensable in shops where tungsten carbide tools are used.

Abrasive Improvements

Abrasive wheels have kept a very even pace with machine development. Modern wheels have a more uniformly controlled structure; grain size and bond have been improved; and new grades have been introduced to successfully grind harder and special materials that have been brought out to meet specific problems in product designs. Wheels for grinding remarkably smooth surfaces have also been developed. While many of the improvements in this direction have been of a minor nature, it is evident that greater possibilities are offered than heretofore if an analysis is made of grinding results in the average shop.

A recently improved design of segmental abrasive wheel and chuck is illustrated in Fig. 38. The chuck is made durable yet light in weight to avoid undue strains on the machine spindle. The segments, mounted separately, are held mechanically, eliminating the need of sulphuring. Each segment is secured in place by means of a clamp which is tightened by a socket wrench. When worn down, the segments may be set out so that a very small portion of abrasive requires discarding.



o o o

AT LEFT

FIG. 39—A bench micrometer that measures to 1/10,000 inch.

o o o

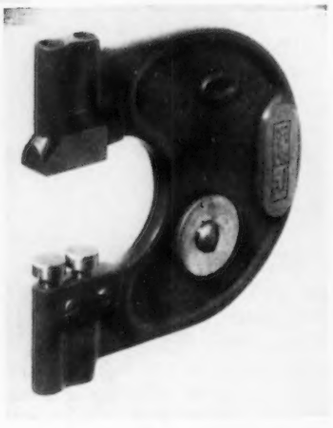


FIG. 40—A limit snap gage that conforms to American gage design standards.

Measuring Tools

Small tools such as micrometers and height gages have been developed to resist wear and strain. In many cases, many of the parts are made of stainless steel of a special alloy composition to insure long-wearing surfaces. Tungsten carbide, too, is being used quite freely to resist wear of gaging surfaces.

A representative mechanical improvement to micrometers is shown in Fig. 39 which represents a

FIG. 41—A dial comparator that records readings of 1/10,000 inch and is calibrated so that measurements of 0.000025 inch can be taken.

o o o

AT LEFT

FIG. 42—Measuring the wrist-pin bore of pistons.

o o o

o o o

AT RIGHT

FIG. 43—A direct reading gage used in checking cylinder bores.

o o o

Brown & Sharpe bench micrometer caliper that employs a device permitting 1/10,000ths in. to be measured almost as readily as our thousandths of an inch with ordinary micrometers. This tool, which has a small auxiliary thimble which reads in ten-thousandths, is particularly useful for general inspection, watchmakers and manufacturing jewelers.

Gage With Carbide Anvils

A limit snap gage made to conform with the American gage design standard as manufactured by Taft-Peirce is shown in Fig. 40. The anvils can be supplied in either hardened tool steel or tungsten carbide. The anvils are made adjustable so that the gage can be set up for the inspection of different parts.

Fig. 41 shows a Federal clearvision dial comparator which is provided with a 1/10,000ths-in. indicator, calibrated so that readings of 0.000025 in. can be readily taken. The anvil of this comparator is lapped to within 75 per cent of the surface and is made accurate to one wave length of light through the optical flat.

A Swedish internal indicator for inside measurements, particularly of holes, is shown in Fig. 42, being used in connection with the inspection of wrist-pin bores in pistons. The graduated scale is provided with two zero marks, one for each pointer. One scale is graduated to 1/1000 in. and the other to 1/10,000 in. The indicator mechanism is arranged so that the finer pointer moves ten times as far as the coarse graduation pointer. Assuming the indicator is used for measuring a hole, the coarse graduation pointer will indicate how much is to be removed before the correct size is obtained. The fine graduation pointer remains at rest until the coarse pointer indicates when the former begins to operate. The fine pointer graduations represent a movement of the anvil of 0.001 in. The operator at the right of the illustration is shown checking the setting of the gage by means of Johansson blocks.

Fig. 43 shows an inspector checking the cylinder bores of a V-8 plug with an extension type internal indicator of similar design. This indicator checks finished bores for size, roundness and taper, and shows variations as low as 0.00005 in. When used in connection with boring, the gage indicates how much stock is to be removed and assists greatly in the setting of boring tools.

An inspection fixture for checking the diameter and locations of several holes in the bell housing of an automotive generator is illustrated in Fig. 44. The plugs which check the location of the holes are held in position with spring plung-

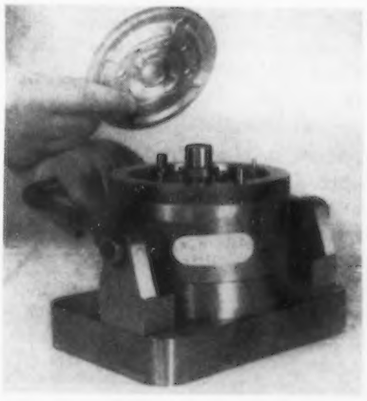
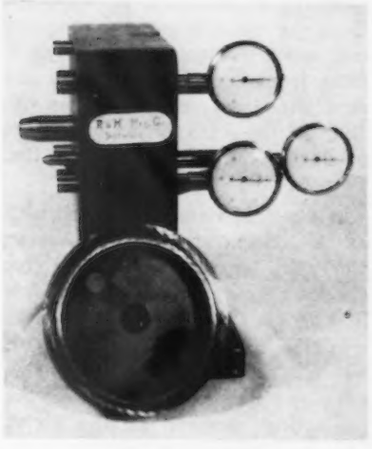


FIG. 44—Inspection fixture for checking alignment of several holes in a bell housing.

o o o

AT RIGHT

FIG. 45—A gage with several dial indicators for checking the height of several bosses at one time.



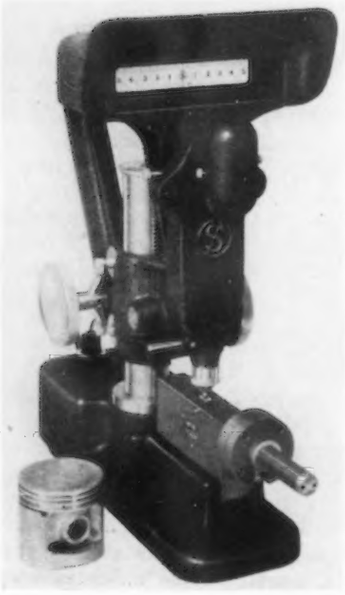


FIG. 46—A visual-type gage for inspecting holes by means of a three-point contact.

ers. If the part being inspected is made to specifications, it slips freely over the plugs. If a hole should be out of alinement the plunger is pushed down, thus indicating to the operator which hole is off size. Should the part fit sung, it can be removed readily by means of a hand-operated ejector. Much development has been carried out in the design of gages of this kind, so that it is possible for unskilled operators to inspect parts rapidly and accurately.

Height of Bosses Checked

A dial-type indicator for inspecting the height of bosses on the same part is shown in Fig. 45. A master ring with buttons for setting the indicators to zero is shown standing at the front of the gage. Once the gage is set, the operator can quickly determine any variations from the correct size and can determine just which boss is off. Both of these inspection gages are products of the R. & M. Mfg. Co., Detroit.

A Sheffield visual gage used both as a comparator for checking workshop gages and a tool for checking production work is shown in Fig. 46. The illustration shows a piston at the left, the hole of which is accurately checked by this gage by placing the piston over the projecting member at the front. The mechanical application is attained by means of the Reed principle which is widely recognized for its dependability. The mandrel of the internal diameter gage carries two strips of tungsten carbide properly spaced in the upper portion of the periphery. The lower contact is a spherical tungsten carbide point which bears against a diamond-pointed upper gaging element. In this way, all internal diameters are measured on a three-point contact and by means of the highest grade of wear-resisting material.

Optical Protractor

The usual practice in checking angular relations between surfaces, edges or holes is to resort to the use of a sine bar, but with the optical protractor shown in Fig. 47 angular measurements can be checked with less effort. The instrument contains a circular glass scale graduated to 90 deg. on either side of zero, each graduation representing the value of one-sixth of a degree. It is provided with a short vernier, permitting readings of one minute of arc. The illustration shows the protractor set up for determining the proper angle of a jig that is to be drilled to accurate specifications.

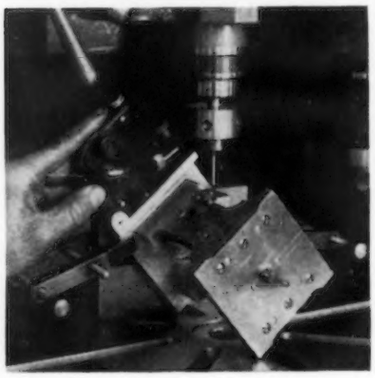


FIG. 47—An optical protractor aids in setting a fixture to a correct angular position.

New Contour Measuring Projector

The new Bausch & Lomb contour measuring projector illustrated in Fig. 48 is an instrument characterized by many radical departures in design and optical performance. It is provided with two screens, one a vertical translucent screen upon which the outline of an object may be traced. The other is an opaque horizontal screen, formed by a small retractable drawing board upon which paper or original drawings may be attached. The image may be changed from one screen to the other instantly by the simple shifting of a small slide. The translucent screen may be replaced by a photographic plate or by a pair of plate glasses mounted in a book-form frame, between which may be placed an original drawing on tracing cloth or tracing paper. Three instantly interchangeable lens systems are provided, making available magnifications of 25, 50, and 100X. This instrument is adapted to the rapid, accurate, and convenient inspection and measurement of many shapes and forms of small parts.

Note: The author takes this opportunity to express his appreciation and thanks to the many manufacturers and users of small tools who contributed information covering many of the developments described in this article.

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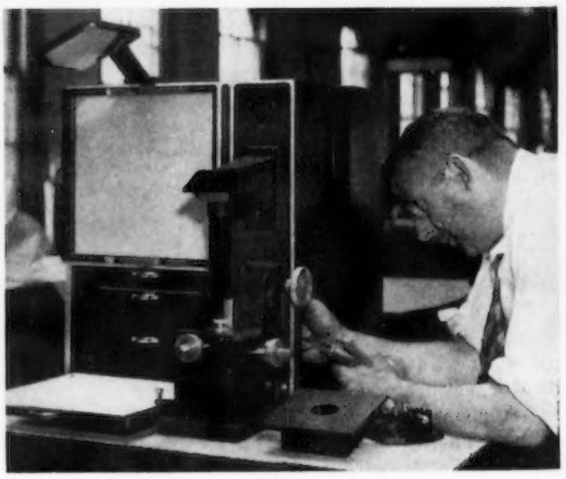

FIG. 48—A measuring projector that enlarges the surface of the part on two screens.

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Carburizing, Nitriding and Modern Refractories

Concluded from the ANNUAL REVIEW NUMBER

By T. W. LIPPERT
The Iron Age, New York

IN the Holden Light Case several basic salts with widely varying melting points are brought together by fusion with sodium cyanide at the time of manufacture. The chemical action during casing is somewhat as follows: One of the chemicals acts on the cyanide to limit the rate at which it breaks down into soda ash. This chemical may be called an inhibitor, but it does not combine with the cyanide. Its action is more in the nature of a catalyst and appears to act on a percentage basis. It becomes necessary then to introduce another chemical which will combine with the inhibitor so that it will be reduced in percentage at approximately the same rate at which the cyanide is reduced. The only practical means found to do this produces a product which is insoluble in water, so that it is necessary to introduce other chemicals which will in turn combine with this latter product to form a new medium which will dissolve in water.

It is obvious that with these various chemical reactions taking place, some means must be available for disposing of the final resulting chemicals which in themselves contribute nothing to the actual case hardening of the metal. In many instances the mechanical loss of the bath which adheres to the work taken from the pot is sufficiently large to accomplish this. In other instances the mechanical loss in this manner is not great enough, in which case the only remedy is to actually bail out a part of the contents of the pot and replace it with fresh solution.

The casing action is as follows: Throughout the molten bath minute bubbles of gas are liberated. When a piece of steel is plunged into the bath, it is surrounded by an exceedingly thin envelope of carbon monoxide gas with a small amount of nitrogen, and it is this gas which produces the case hardening. This action takes place at a relatively low temperature. Increasing the temperature increases the thickness of the gaseous envelope, but the thickness of this envelope has nothing to do with the rapidity with which the case is formed. The more rapid casing at a higher temperature results from the increased velocity of the molecules of carbon monoxide and nitrogen gas.

This Light Case may be operated at a very high temperature to produce a rapid case depth, but the most economical temperature for most classes of work lies in the range 1475 to 1525 deg. F. The articles so treated are easily cleaned.

The A. F. Holden Co. also markets a procedure called Hard Case. The chemical and casing action is similar to the Light Case, but the Hard Case method is designed as a rapid and effective means for producing a high-carbon low-nitrogen case for articles requiring a hard case 0.008 to 0.025 in. deep. The operating temperature is the same as for the Light Case, and the work is just as easily cleaned.

The average Hard Case penetration for S.A.E. 1015 steel at 1500 deg. F. is about 0.006 in. in 15 min., 0.020 in. in 1 hr. and up to 0.125 in. in 35 hr.

It is well known that the nitrided case is at present the hardest condition producible in steel. A surface hardness of 1000 Brinell is obtained, and such a hardness together with a ductile core has a wide and growing range of industrial usefulness. But such parts are seldom suitable for applications

coming under the category of tools or for other purposes where extremely high surface pressure is encountered. For the case will usually crack as the core is not hard enough to support the case under such severe operating conditions.

But it has been found that certain alloy tool steels, apart from the lower carbon-aluminum steels especially designed for the purpose, respond well to the nitriding process after having been given their regular heat treatment. Some high-speed steels containing cobalt respond well to nitriding. Another nitriding tool steel which attained prominence during the year is Cobaltcrom—P R K, made by Darwin & Milner, Inc. This steel analyzes 1.50 to 1.70 per cent carbon, 13.50 chromium, 3.30 cobalt, 0.80 molybdenum, 0.20 vanadium, 0.50 nickel and 0.60 per cent silicon.

When nitrided by the ordinary method, after being properly heat treated, this latter steel develops an extremely hard 0.025 in. case measuring about 1050 to 1150 Vickers Brinell at the surface. There is no perceptible growth or "building up" of the surface during nitriding, and the core is practically unchanged during nitriding.

This steel has an admirable industrial record to date. The lives of extrusion dies have been increased more than 15 times; swaging dies operating on stainless steel give 10 days' service as compared with one day for ordinary steels. Stamping dies for parts made of mild steel strip have outlasted the tools previously used by about 25 to 1, and drills, jigs and bushings in one instance lasted 20 times as long as plain-carbon steel previously used. This new nitriding steel is being used to a great extent for saws cutting bakelite and fiber, and it has found use for tube-drawing mandrels, valve seats, camshafts, etc.

Any research on the rapid nitriding of steel should be of interest to all heat treaters. Such a study was reported to the American Society for Metals by the U.S.S.R. metallurgist, J. E. Kontorovich, and the results obtained served to minimize the greatest shortcoming of nitriding, viz., a reduction of time required by one-third.

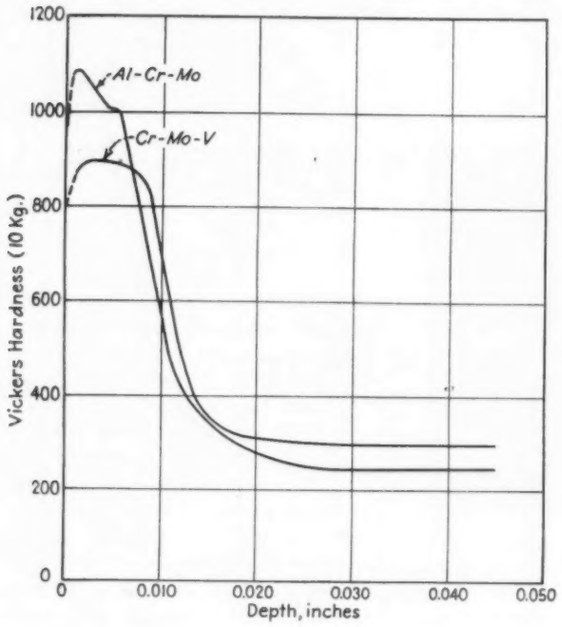


FIG. 3. For nitriding, the long established aluminum steels are finding a competitor in the new aluminum-free chromium - molybdenum-vanadium alloys. This depth-hardness comparison demonstrates the excellent showing made by a nitrided Cr-Mo-V alloy (2.65 per cent chromium) as against a standard Al-Cr-Mo nitriding steel.

Two steels were used. Both had a composition of 0.25 per cent carbon, 1.50 chromium, 0.40 molybdenum, 0.50 manganese and 0.50 silicon. One steel, however, had 0.70 per cent aluminum whereas the other contained 0.20 per cent vanadium. For both these steels about 50 hr. at 1740 deg. F. was required to get a case 0.016 to 0.020 in. thick, and only 25 per cent of the ammonia was dissociated.

Nitriding Time Reduced

A two-stage heat was tried on both steels. First a low temperature was used followed by a high temperature and, in the second case, a high temperature followed by a low temperature was employed. Neither gave satisfactory results on both steels. Then, acting on the assumption that the concentration of nitrogen at the surface and its speed of inward diffusion are roughly proportional to the temperature, it was decided to try a three-stage process. In the first stage the temperature of 930 deg. F. was indicated as determining the extent of nitride dispersion. In the second stage, at 1100 or 1200 deg. F., a high nitrogen content was built up at the surface, and the speed of diffusion inward was accelerated. In the third stage, at 930 deg. F., the rate of saturation of the outer layers with nitrogen is slower than the rate of diffusion, and thus reduces the concentration gradient and the brittleness of the surface.

Parts are now being nitrided commercially in the U.S.S.R. by this process in one-half to one-third the time required at 900 deg. F., and 65 to 70 per cent of the ammonia is dissociated. There is a very gradual decrease in hardness from the surface to the core, and the surface itself is not excessively brittle.

German researchers, A. N. Dobrowidow and N. Schubin, have also done some interesting work in nitriding, particularly with the nitrogen hardening of cast iron. To secure a uniform nitrided layer on cast iron, it was found necessary to use an iron without large graphite flakes; a desirable structure was obtained by annealing white cast iron. The content of alloy elements necessary for nitride hardening, aluminum and chromium, had to be chosen so that the white iron could be graphitized fairly readily. After graphitization it was desirable to eliminate free ferrite by a quenching treatment. A cast iron with about 2.75 per cent carbon, 0.25 silicon, 0.8 aluminum, and 1 per cent chromium could be graphitized on annealing about 8 hr. at 1830 deg. F., after which the formation of free ferrite was avoided by quenching from 1650 deg. F. into oil to give a troostitic structure. On nitriding such cast iron for 40 hr. at 930 deg. F. a uniform nitrided layer with a Brinell hardness over 700 was obtained. The toughness of the layer was improved by a small nickel addition.

In the study of suitable alloy

steels which respond favorably to nitriding, many combinations of common alloying metals have been advanced. The first significant discovery was made a number of years ago when Fry's researches proved that certain alloying additions to steel were necessary in order to produce suitable case hardening. Principal among these elements is aluminum. The earliest nitriding steels contained between 1 and 2 per cent aluminum together with chromium in about equal amount, and even today the steel most commonly used is one containing approximately the same original proportions of aluminum and chromium, together with a small amount of molybdenum. In some more recent steels the chromium has been dispensed with in favor of an increased molybdenum content and, also, some steels have replaced aluminum with a relatively high vanadium content.

It has been reported that the chromium-vanadium construction steel S.A.E. 6125 will nitride to give a hard layer of unusual depth and a hardness corresponding to that of case-carburized steels. Further, data are available indicating that high-speed and certain other highly alloyed tool steels, as well as austenitic iron-chromium-nickel alloys containing aluminum, may be effectively surface-hardened by nitriding. Various efforts have been directed toward enhancing the core hardness of the aluminum-chromium-molybdenum steels by making such alloy additions as 2 to 4 per cent of nickel, or increasing the molybdenum together with tungsten and vanadium, the latter additions also being accompanied by an increased carbon content.

Aluminum-free nitriding steels, containing intermediate percentages of chromium together with additions of molybdenum and vanadium, have found a very small place in the nitriding literature. And from the few random compositions reported on, indications are that the possibilities of this type of steel have been very largely overlooked. As already indicated, vanadium and molybdenum each has been used in commercial nitriding steels, but no satisfactory application of both in the same product has thus far been made. Moreover, no widely accepted steel for nitriding has not contained aluminum. Thus it was with considerable interest that heat treaters read the announcement by Jerome Strauss and W. E. Mahin, both of the Vanadium Corpn. of America, of the excellent nitriding characteristics of an aluminum-free series of chromium-molybdenum-vanadium steels. Fig. 3 shows the depth-hardness characteristics of such a steel containing 2.65 per cent chromium (0.14 carbon, 0.44 manganese, 0.24 silicon, 0.56 molybdenum, and 0.27 vanadium), as compared with an aluminum-chromium-molybdenum steel of the common nitriding type. Note that the test is very favorable for the steel containing no aluminum.

As pointed out in this review and also by the authors of this paper, many nitrided steels may have a core hardness too low to lend suitable support to the thin hard case so that, under concentrated loads, the case often deflects beyond its ductility limit with consequent cracking or spalling of the case. Hence it is of interest that experiments have shown that for equal surface hardness the chromium-molybdenum-vanadium steels are more ductile in the thin surface layer than are the aluminum-chromium-molybdenum steels. The 2.65 per cent chromium steel previously mentioned was found by the authors to maintain its hardness and tensile strength very well. In addition, it has excellent ductility and toughness (whether wrought or cast) on tempering above the nitriding temperature. Thus there is a better than ordinary support for the relatively thin surface layers of the nitrided product. A number of other steels belonging to the same series as the 2.65 chromium steel were also described by the authors. All of these steels are aluminum-free and contain chromium-molybdenum and vanadium in varying amounts, and all have somewhat similar nitriding and core properties. These new steels are very fine-grained, both in the case and in the core. They are judged to be excellently suited for the production of finished products of high quality, and by their use some of the manufacturing troubles inherent in steels of high aluminum content are avoided.

FIG. 4. View taken through a charging door of a hot electric furnace, showing the severe conditions imposed on the silica back wall, particularly at the slag line.

Refractory Makers Keep Pace

The heat-treating fraternity, for the most part, is not as demanding on the refractory industry as are the industries which melt steel and

iron. Temperatures encountered in heat-treating plants are not particularly severe, nor are the corrosive and erosive actions major items. However, carburizing and nitriding plants are constantly on the lookout for whatever innovations the refractory makers may offer, and are quick to adopt developments applicable to their operations. This is exemplified by their rapid acceptance and current wide application of refractory concretes.

Any examination of notable improvements in refractories must necessarily concern itself with high temperature applications to a major extent. Significant changes were made during the year, and these changes are particularly noteworthy when one considers that a few years ago refractory technologists themselves were dubious of any notable betterment in common refractories.

Improved Refractories Available

A refractory review should be preceded by a consideration of the paramount objectives. A study of the refractory-steel mill relationship will show that problems encountered in basic alloy steel production are dominated by one particular requirement. That is, *alloy steel producers are even more concerned with the quality of their steel as affected by refractories than they are with refractory service life and cost per ton.* Even now a number of mills employ men experienced equally in refractory technology and steel metallurgy whose main objective is the reduction of non-metallic inclusions through the improvement of refractories.

As an example of the problems encountered and the severe loads imposed on refractories, the view shown in Fig. 4 is typical. In this electric furnace note the severe conditions imposed on the silica back wall, particularly at the slag line. Another example of what refractories must withstand may be seen in Fig. 5, which shows an open-hearth bulkhead badly eroded by the impingement of the outgoing flame. To minimize these types of failures is an objective second only to the reduction of non-metallic inclusions.

In a lecture presented before the American Ceramic Society this summer, Gilbert Soler of the Timken Steel & Tube Co. pointed out that higher furnace production rates and a substantial shortening of the open-hearth melting time is utterly dependent on the temperature at which roof brick will fail. At present silica brick is still the main roof material, inasmuch as it has high spalling resistance and a load-carrying capacity, which is retained to within 100 F. deg. of the fusion point. Although acid chemically, silica brick resists basic slag conditions because of the formation of immiscible liquids with ferrous, calcium, manganese and magnesium oxides. Sodium and potassium oxides and alumina hinder immiscibility and should therefore be avoided in the manufacture of silica refractories and in the slags used with such refractories.

In addition to reviewing the chemical reactions taking place between the slag and the refractories, Mr. Soler stressed also that the deterioration of ladle linings now commonly used is primarily due to the action of the slag used as an insulating blanket over the steel in the ladle. However, the composition, viscosity and temperature of the steel also have an effect, low-carbon and high-manganese steels being particularly destructive. In addition, the size and shape of the ladle, together with the direction and velocity of the stream during tapping, definitely affect ladle life. The period during which the steel is held in the ladle during teeming offers possibilities for the solution and entrainment of refractory particles in the steel, and considerable study remains to be done in overcoming this danger.

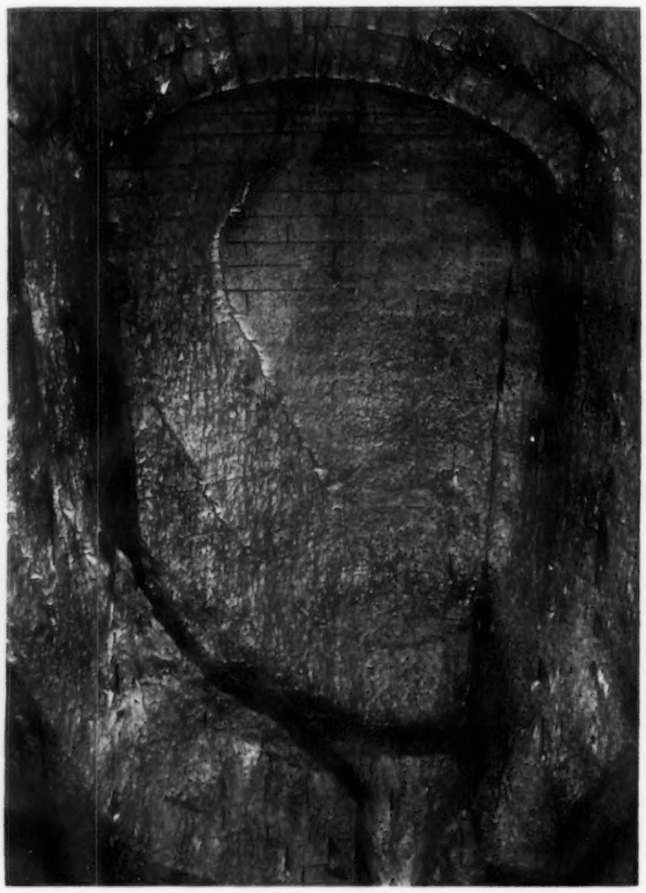


FIG. 5. Open-hearth bulkhead showing the effect of impingement due to direction and velocity of the outgoing flame.

Fireclay brick is theoretically unsuitable for ladle lining, but as yet no truly satisfactory brick has been developed. A basic material with the proper physical properties should be ideal, but such a product is not as yet on the market. It is significant to note that although steel is made on basic bottoms and under a basic slag, inclusions of magnesium oxide or calcium oxide are not found in the steel. These basic substances are not soluble in

steel and are apparently not wetted by it. Likewise, they are resistant to the action of basic slags and fluxes. In ladles chrome and magnesite brick have been tried but have been found unsatisfactory because of spalling, high heat conductivity, or chrome contamination of the steel. *A distinct need exists for a good basic ladle brick in plants producing high quality steel.*

Other important points which are possible sources of non-metallic inclusions in the ingot, according to Mr. Soler, are runners, sleeves, nozzles, hot tops, and mold plugs. Refractories for sidewalls, roofs and bottoms of the soaking pits, reheat furnaces, forging furnaces and heat treating furnaces must be selected to prevent bottom contamination or the possibility of the surface being contaminated by spalls or drops of molten refractory material.

With these particular problems of the steel industry in mind, a review of unique refractories which have come on the market in the past few years is in order. Naturally, the first to be mentioned should be super-duty fireclay brick, which represents the highest point to date in the improvement of strictly fireclay brick. This brick is characterized by high density and volume stability; linear shrinkage after heating for 5 hr. at 2912 deg. F. does not exceed 0.5 per cent.

Secondly, the mineral olivine has been exploited to a considerable extent as a refractory during the past year. In making this type of brick, dead-burned magnesite is generally added for the purpose of converting such accessory impurities as serpentine and talc to forsterite, which is the most stable high-temperature magnesium silicate known. This refractory will stand up well at temperatures well over 3000 deg. F.

Thirdly, the past year has also witnessed a constantly increasing use of electrocast refractories. These materials, by being cast directly into commercial standard shapes, differ from the older well known electric furnace products which were made by electric fusion, cast as ingots, crushed, rebonded and fired in the usual way. There are a number of different types of this material. One form is cast mullite made by the Corhart Co. In Europe, an electrocast chrome spinel called Siemensit has been produced. Like bonded chrome brick, these electrocast materials are neutral with respect to resistance to acid and basic slags. They have an entire lack of voids, they have mature crystallization, there is an absence of any low melting liquid phase and they are easily controlled as to chemical constitution.

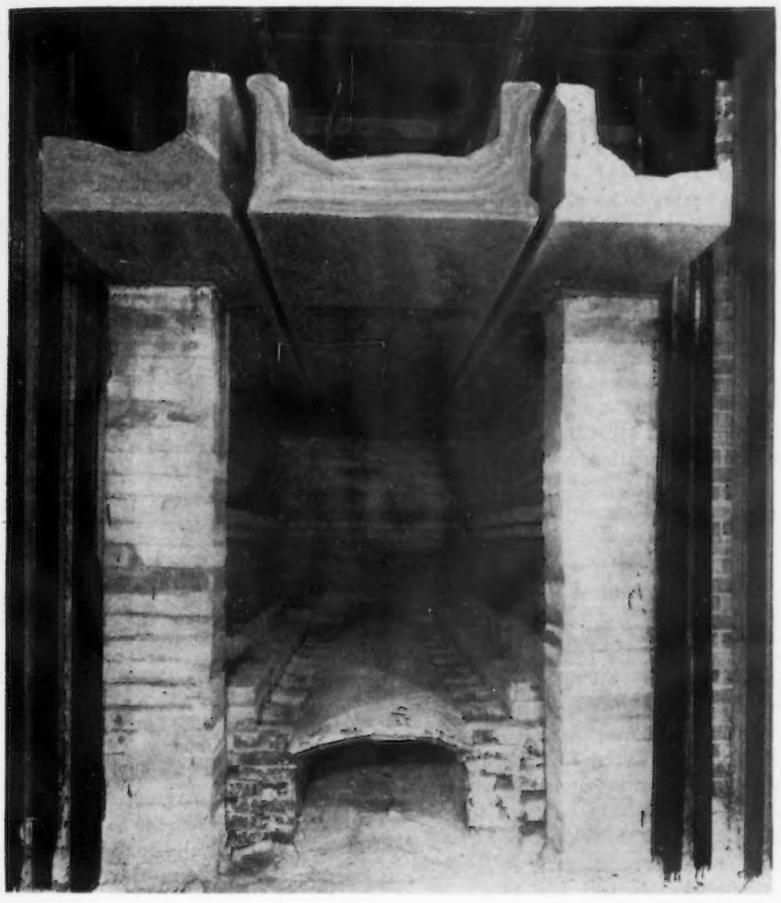


FIG. 6. Continuous furnace for enameling sheet steel and cast iron. The entire roof is cast from Hydrecon, a patented refractory concrete. Note that the roof, which weighs about 8400 lb., is suspended from the ceiling by means of alloy steel bolts.

Compressed Brick

A fourth factor in the refractories market is unburned high-temperature brick. The production of refractories without burning, equally as good as fired ones, has always fascinated the refractories producer. Consequently, the Ritex bricks of the General Refractories Co. are gaining a prominent place in literature, for they are not burned. In producing these bricks the interfritting of the grains has been developed to a maximum degree through the use of only a selected band of sizes and the addition of these sizes in proper proportions. Also, the forming pressure has been stepped up to 10,000 lb. per sq. in. to reduce voids between grains, and a refractory chemical bond is used which contributes to both the effect of careful sizing and high forming pressure.

A Ritex magnesite and a Ritex chrome brick are now in regular commercial production. The bricks are strong and hard when cold, well bonded at very high temperature and show only a negligible volume change when heated to service temperatures. They have high resistance to spalling and can be used constantly at temperatures in excess of 3000 deg. F.

The rapid recognition of the value of insulation has also resulted in further development of various forms of insulating refractories in this country. Most of the products now on the market have similar refractoriness and insulating characteristics, and an ex-

tended discussion of the details in their application would be too involved for inclusion in this review. It might be mentioned, however, that a new insulating brick with excellent physical characteristics has just been placed on the market by Gibbons (Dudley), Ltd., Gornal, England. This new brick, designated as H.T.I., is claimed to have an insulating value over six times that of ordinary firebrick, it has a machined surface finish, great mechanical strength, very high refractoriness and no after-contraction.

Hydraulic Refractories

In addition to the new and improved refractories just described, there is still one other type of material which each year receives more and more attention. Materials which belong to the hydraulic refractory group seem at first glance to be ideally suited to practically all operating conditions. They are easily made up, they can be troweled or poured into place by unskilled labor with the simplicity of concrete, they can be exposed to full furnace heat within 24 hr. of installation, their refractoriness is high, they can be easily patched and they are generally absolutely neutral to either acid or basic chemical agents.

Well known and authoritative American commercial testing laboratories report several brands of refractory concrete as having a fusion point as high as 3300 deg. F. Likewise, the Paris, France, Laboratoire Officiel du Syndicat des Fabricants de Produits Céramiques de France, has conducted chemical and physical tests on a new French product analyzing 30.30 per cent silica, 56.85 alumina, 4.33 iron, 3.35 calcium, 0.04 magnesia, 2.45 titanium, 0.13 potash, 0.31 sodium and the remainder unstated. This laboratory reported that after 2 hr. at 2912 deg. F. the material had only a 2.3 per cent shrinkage. Likewise at this temperature there was apparently little or no disintegration, although under a load of 30 lb. per sq. in. the refractory began to crush and collapse at about 2770 deg. F. Another French refractory concrete, Duralite, has been reported by *Chaleur et Industrie* as having a crushing strength of 2250 lb. per sq. in. immediately after drying, and a cold crushing strength of about 6000 lb. per sq. in. after the concrete had been baked. Like all other refractory concretes, Duralite is recommended for the pouring of special shapes or use as a plastic or putty for quickly closing fissures, cracks and voids in furnace lining, and for all other types of hot repairs. This material is said to have a fusion point as high as 3200 deg. F., corresponding to the working range of the best extra-aluminous super-refractories. Its softening point under a load of 30 lb. per sq. in. is in the neighborhood of 2920 deg. F.

An examination of these physical and thermal characteristics would seem to indicate that hydraulic refractory concrete is what technologists have been seeking these many years. However, many experimenters point out that there are natural errors in determining high temperatures and also insist that the claims for 3200 deg. operation of refractory concretes are not substantiated in actual operation.

The sphere of refractory concretes seems to be definitely limited to applications wherein the maximum temperature encountered is under 2900 deg. F. Thus it is an ideal material for lining annealing pits, casting reheating furnaces, for the construction of arches, walls and bottoms of furnaces, car tops for annealing furnaces, ingot holding pits, etc. But it certainly has no application in contact with molten steel; therefore it is ruled out for open-hearth hearths, walls and roofs, etc.

Many Patented Concretes

Today, there are some 25 trademarked domestic brands of refractory concrete. All of them possess the property of hardening on the addition of water in about 24 hr. Most of them contain carefully selected and proportioned aggregate when shipped, thus saving the user the trouble of selecting and crushing suitable refractory aggregate and proportioning his mix. Refractory concretes are considerably more expensive than firebrick but this added expense can be avoided to a great extent. For lining doors and making walls, etc., waste brickbats can be used to fill most of the space and the concrete can be poured as a binder and a surface finish. In this manner, not much refractory concrete is used and the cost is kept down.

For making refractory concrete it is necessary to have a binder which will give the required cold strength to hold the lining in place until it has developed a ceramic bond under operating temperatures. It was natural that originally many attempts were made to use Portland cement as a binder for the refractory aggregates, and some degree of success was obtained for low temperatures (1000 deg. F. and under). But the constitution of Portland cement did not lend itself to useful results at temperatures even as high as 2000 deg. F. It was because of these unsuccessful attempts to use Portland cement at the higher temperatures which developed in refractory users' minds a distinct prejudice against the use of all hydraulic cements. And this prejudice has been hard to break down, although at present many potential users are coming to the full realization that they have at hand an ideal tool for many of their refractory needs.

Hydraulic Installations

The definite improvement of refractory concrete resulted from the discovery of high alumina cement for war use as a quick setting material for gun emplacements, etc. This lumnite was introduced to the trade in refractory concretes as early as 1924, and practically all competitive materials of today use it as a binder. Through its use, the temperature range of the refractory concrete was raised to around 2900 deg. F., thereby throwing this material open for almost all industrial applications with the exception of uses where it is in direct contact with molten steel or iron.

Of the many domestic hydraulic refractories now on the market, the physical and thermal characteristics and descriptions of a few typical installations are of interest. A refractory concrete designated as No. 5 Hydrecon and made by J. H. France Refractories Co. has been used in pouring a fully suspended roof for a continuous furnace for enameling sheet steel and cast iron at the Woodlyn, N. J., plant of the Philadelphia Porcelain Enameling Co. A picture of this installation is shown in Fig. 6. The entire roof weighs about 8400 lb., and is suspended on 2-in. alloy metal bolts from angle irons on top. The bolts penetrate the slab and have washers on the bottom, thereby accounting for the apparent roughness of the underside. It can be seen that

such a refractory concrete installation carries itself, whereas brick arches and tile roofs require reinforcement in the form of tie-rods. This roof has already been in operation for more than two years and shows no sign of deterioration. Tests made on these types of refractory concretes show that, unlike plastic refractories, there is a progressive weakness from the cold side to the hot side after the material has been placed in operation. On the hot side, this Hydrecon will show a crushing strength of 620 lb. per sq. in., whereas on the cold side the crushing strength will be as high as 1300 lb. per sq. in. Deterioration and disintegration due to rehydration do not occur with this type of refractory, and in some cases there is even a beneficial result from rehydration. For instance, the crushing strength was 650 lb. per sq. in. three weeks in a drier at a temperature below the vitrification stage is about 461 lb. per sq. in. However, after three weeks under a damp cloth and then placed for three weeks in the drier, the crushing strength was 650 lb. per sq. in.

Cast-Refract made by the Quigley Co., Inc., is very similar to Hydrecon. Cast-Refract has an upper temperature limit of about 2800 deg. F., and has found considerable application in heat-treating furnaces. This same company markets Insulcrete, which is a new insulating hydraulic refractory having about 40 per cent lower heat storage than firebrick and less than half the conductivity. The A. P. Green Firebrick Co. also has brought out a similar material.

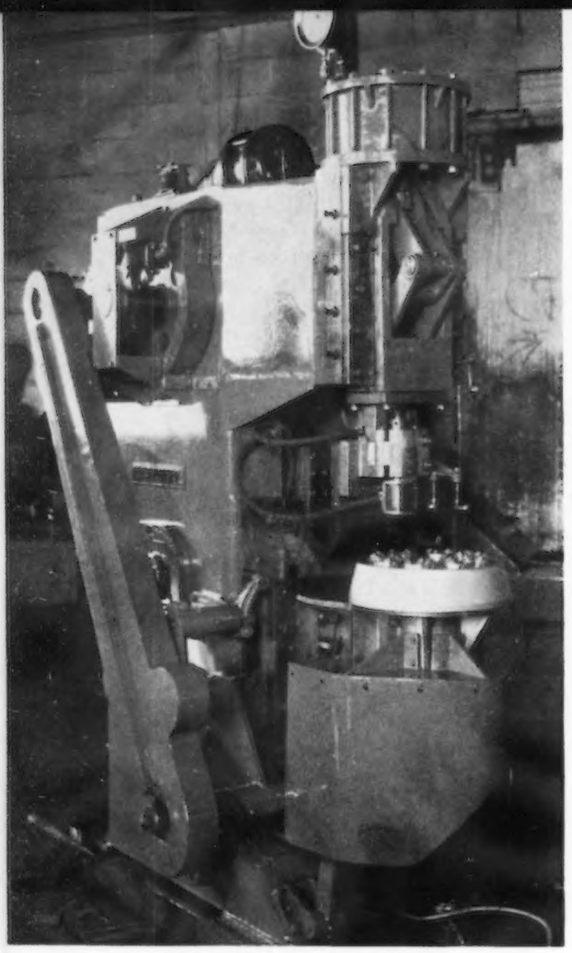
The Johns-Manville Co. markets H. T. Firecrete, which has the same sphere of application as both Hydrecon and Cast-Refract. Mixed with water on the job, this type of material can be used for heat-treating furnaces, linings for doors, pipes or flues and for poured or cast baffles, dampers and special shapes. The material is exceptionally strong and highly resistant to spalling, with practically no drying or firing shrinkage even when used up to 2800 deg. F. The Johns-Manville Co. also markets light-weight Firecrete, which is 40 per cent lighter in weight than firebrick. It also has 40 per cent lower heat storage capacity than firebrick, it is particularly suited for use in intermittently operated furnaces because of the speed with which the furnace can be brought up to temperature and the fact that 40 per cent less heat is wasted as the furnace cools. Its low thermal conductivity, less than half that of firebrick, also recommends it for continuous furnaces. Light-weight, combination insulating and refractory doors and roofs for furnaces are two of the many more important applications. To show the great weight saving through the use of this material, note in Fig. 7 how the large panel is easily lifted by a man. If made of ordinary firebrick, the panel would weigh 240 lb.

FIG. 7. Light-Weight Firecrete, a refractory concrete, lowers the weight of furnace construction. This panel is easily lifted by one man, whereas a similar panel made from ordinary fire brick would weigh 240 lb. The large face of the panel shows no deterioration after having been subjected to a temperature of 2500 deg. for 24 hr. and then quickly cooled by cold air blasts.

Another type, Hearth-Crete, has been developed as a furnace bottom refractory to withstand heavy loads, resist abrasion and wear, and resist reactions with metallic oxide. A billet heating furnace floored with this material has been in operation one and one-half years with one-ton billets constantly being pushed over the floor. No skid rails or water-cooled pipes are used. However, a slight slippery surface develops on the refractory at 2400 deg. and serves admirably as a lubricant, thereby minimizing wear. Hearth-Crete is the only hydraulic chrome refractory being made.

Practically all of the major refractory makers make and sell refractory concretes of the same type as the ones mentioned. Several others of this general group are Moldite, a product of the Refractory Engineering Co., and Lumnite, a product of the Atlas Lumnite Cement Co. A similar product also is the Ciment Fondu of the Lafarge Aluminous Co., Ltd., of England.

From the foregoing, therefore, it is evident that there are a multitude of applications for which these types of refractories are desirable, particularly when it is wished to cast *in situ*. Although the sphere of utility of these materials is below 2900 deg. F., there seems to be no reason why many high-temperature furnaces could not be cast as a concrete monolith with no joints whatsoever and lined with high-temperature refractories if necessary. Moreover, the process can be economical, since the major ingredient can be the scrap firebrick readily available in most works.



ONE of four precision press-type welders built by the National Electric Welding Machines Co., for manufacture of the new all-metal radio tubes. This one, the largest, is for welding the metal shell to the header.

Progress in Welding And Cutting In 1935

Concluded from the ANNUAL REVIEW NUMBER

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By R. E. MILLER

Machinery Editor, The Iron Age

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Electric Resistance Welders Highly Developed

ELECTRIC resistance welding machine applications were both numerous and impressive. Highly productive equpiment for automotive plant use was prominent as heretofore, but the precision-type machine developed for the manufacture of the new all-metal radio tubes were of challenging interest also, because they, together with the development of new materials, made these tubes commercially practicable. There were also interesting adaptations for the manufacture of refrigerators, burial vaults, and other products. A highly successful reecnt application of percussion welding is in the joining of handles to pan bodies. Developments in resistance welder control equipment included a simplified Thyratron tube device.

The extent and growth of resistance welder use in the automotive industry is reflected from the fact that on the body and chassis of one of the more popular cars there are some 3240 resistance welds. Of these, 3194 are spot, 44 flash butt, and two are seam welds. Furthermore, accessories supplied by parts manufacturers for the same car include an additional number of welds in their construction. A few years ago the same car had a total of 1339 resistance welds.

In the manufacture of modern refrigerators, resistance welding is being employed extensively in connection with both the steel cabinet, including hinges and door latches, and working parts, such as ball floats, evaporators, and liquid receiver cylinders.

In type, the new machines included spot, projection, seam, flash and percussion; in size they ranged from small gun and bench-type welders to a very large unit weighing upward of 45 tons; and in design purpose they ranged from laboratory or experimental use to ultra mass-production applications.

Precision Machines Required for Metal Radio Tubes

For welding all-metal radio receiving tubes, the National Electric Welding Machines Co., Bay City, Mich., furnished a set-up of four special precision press-type machines. One, the largest, welds

the metal shell to the header. It has a special air cushioned pressure device capable of delivering very accurately controlled pressures, and powered with a special water cooled transformer, delivers 75,000 amp. A machine of the same size is used to weld several eyelets to the header—all welded at one stroke. These machines weld at a speed of about 2400 welds per hr. Each unit has an eight-station dial feed.

For welding the top eyelet assembly and the exhaust tube, welders of 50-kva. capacity and equipped with air-cushioned pressure devices and with dial feeds are employed. Getter screens are welded into the metal shells by means of a 25-kva. bench-type machine. The pinch-off operation which follows exhausting of the air in the radio tube, is accomplished by a special 25-kva. air-actuated unit designed for application to the multi-head machine used to exhaust the air in the tubes.

The Thomson-Gibb Electric Welding Co., Lynn, Mass., has also developed machines for metal radio tube welding. One of them, a No. 2 welding press, is equipped with a multi-station dial feed, automatic indexing fixture and work ejector, and operates at 20 to 60 strokes per min. A small machine of the same type is also employed, as well as gun welders of new design, the latter for pinching and welding-off the exhaust tube after the shell has been exhausted.

Large Aluminum Spot Welder

What is said to be the largest machine ever built for welding aluminum was supplied by the Federal Machine & Welder Co., Warren, Ohio, for airplane work. It is a 400-kva. pneumatically operated spot welder having a throat depth of 72 in., a vertical opening of 36 in., and capacity for welding two pieces of ⅛-in. aluminum. Water-cooled, 1-in. diameter Mallory metal electrodes are used. Air pressure of 1500 lb. may be applied at the end of the 72-in. arm. Thyratron tube current control permits timing from 20 cycles down to ½ cycle.

Non-ferrous evaporators used in an electric refrigerator are rapidly welded on a special multiple-electrode spot welding press built by the National Electric Welding Machines Co. The machine has four 75-kva. water-cooled transformers, one for each electrode. An automatic ratcheting fixture for moving the evaporators sideways, back and forth, permits any desired spacing between welds. From 300 to 400 spot welds are made in rapid succession on each evaporator.

Portable equipment consisting of a welding gun operated by a single push-button switch, and a compact steel cabinet containing all the transforming, regulating and timing apparatus has been added to the line of the Thomson-Gibb company. It is particularly adapted for assembly line production or to work which is fabricated in jigs, such as the refrigerator applications shown in one of the accompanying illustrations.

A synchro-hydromatic welder which combines a hydromatic unit with a new sychronous control of the welding circuit is being introduced by the Roth Welding Engineering Co., Detroit. It is simpler than its predecessor and more adaptable for general production. It may be used where only 10 spot welds are required on one individual job.

Makes 1200 Projection Welds a Minute

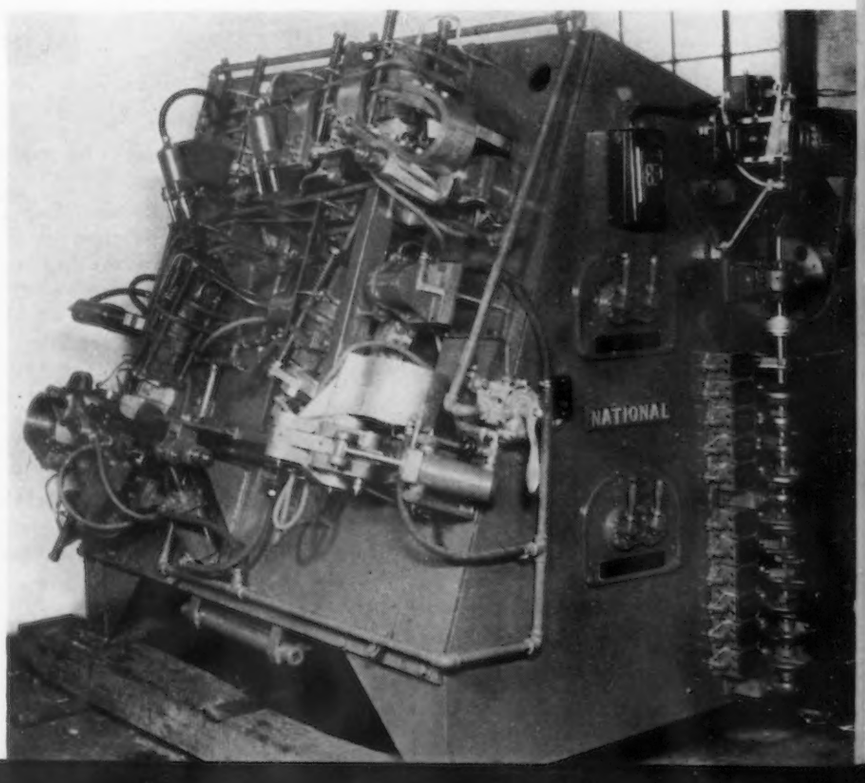
A 600-kva. projection welder notable for smooth appearance as well as for high production was developed by the American Electric Fusion Corpn., Chicago. It is capable of making 21 spots simultaneously over a length of 36 in. As speed of operation is adjustable from 30 to 60 strokes per min., up to 1200 welds can be made a minute. The weight of the machine is more than 14,000 lb.

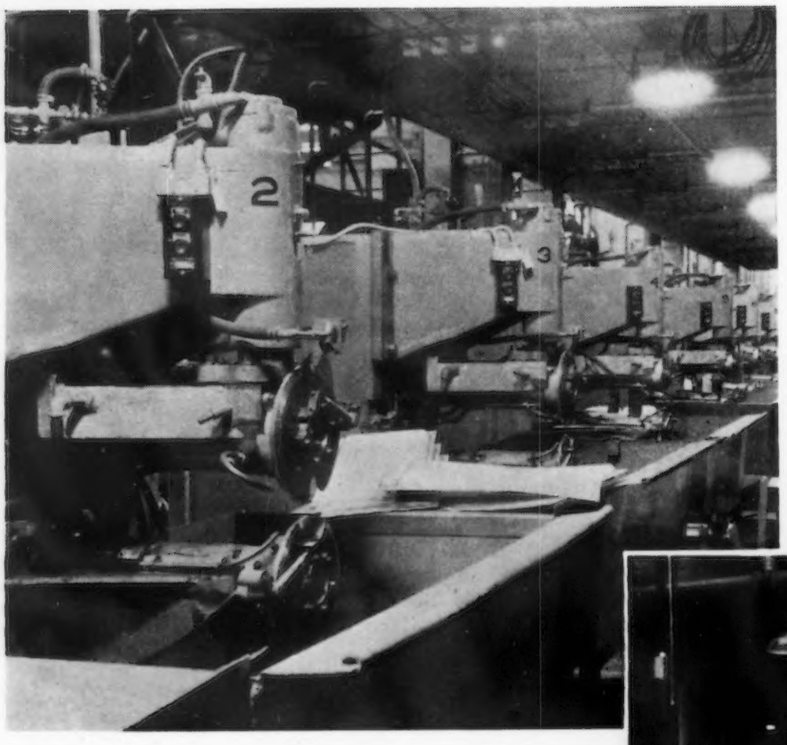
An interesting development of the National Electric Welding Machines Co., was a special multi-hydraulic welder designed to make eight distinct groups of projection welds on an automobile door frame in one operation. The welding is entirely automatic. The machine is equipped with four transformers, each having its own heat regulators and magnetic contactor. Hourly production from each unit is in excess of 200 door frames.

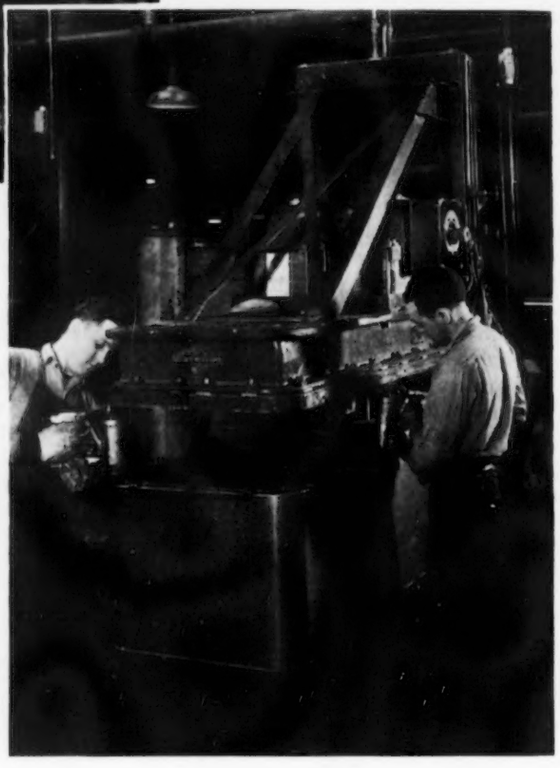
High Production Seam Welders

For producing evaporators for G-E refrigerators, the Thomson-Gibb Electric Welding Co. has supplied a battery of 16 interesting special intermittent seam welders. As the welds must start close against an obstruction at each end of the shell, the welding rolls were made of segment type; they are fitted with counterweights that bring the segments back to the starting position as soon as the operating foot valve is released.

MULTI-HYDRAULIC welder designed by the National company to weld eight groups of projection welds on an automobile door frame in one operation. Production is at the rate of 200 door frames an hour.







ABOVE

BATTERY of Thomson-Gibb seam welders used in producing evaporators for G.-E. refrigerators. Each machine makes 300 spots per min. Use of segment-type welding rolls is a feature.

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AT RIGHT

GUN welders and special welding fixture supplied by the Thomson-Gibb company for production assembly-welding of the back to a steel refrigerator cabinet.

Each machine makes 300 spots per min.

Seam welding of gasoline tanks is an interesting welding operation at the Ford Motor plant. The tanks are made in two halves, which are faced together and the edges welded down one side, across the end, back up the other side, and across the other end. A traveling carriage moves the tank to various positions. The welder runs 102 in. seam in 90 sec. There are about 11 spots to each inch.

Large Flash Welders Give High Output

For welding tire and automobile rims up to 12 in. wide, the Swift Electric Welder Co., Detroit, has supplied a 500-kva. flash welder the output of which is 400 to 500 rims an hour.

With the development of sweeping fender lines, with deep crowns and long skirts, the Pontiac Motor Co., found it economical to make front fenders in two pieces and weld them together. The outer and inner sections of the fender, each 90 in. long, are flash welded so well as to obviate the necessity for soldering after grinding off the flash. The special flash welders employed, built by the Taylor Winfield Corpn., join the two parts of the front fender in 6 to 7 sec. Uncommon accuracy is required in the welding dies.

Burial vaults are flash welded on a mass production basis by an unusually massive machine built by the Federal Machine & Welder Co., Warren, Ohio. Marked changes in manufacturing, including the design and forming of the vault members, were made with the introduction of this equipment. The welder is 15 ft. high when the dies are open, and weighs 90,000 lb. To facilitate work handling, the machine is set in a pit. Current is furnished by two 250-kva. transformers. Pressure of 75 tons is applied for the upsetting.

Percussion Welder for Enamelware

Substantial lowering of cost with a much desired quality improvement in the production of pans and other enamelware is attributed to the use of a percussion welder developed for this work by the Federal Machine & Welder Co. The machine overcomes a previous difficulty due to incomplete joining of the overlapping pieces of metal. When not completely joined, a certain amount of acid or alkali gets in between during the pickling or washing; this generates a gas during enameling which leaves a black line around the handle anchorage. The percussion welder butt welds the handle directly to the side of the utensil without any flange. Electronic tube control prevents extrusion of excess metal at the weld. One operator can weld two handles on to dishpans at the rate of 300 pans per hr.

Improved Resistance Welder Controls

Thyratron control equipments for resistance spot welders have

been improved by the General Electric Co., to permit wider application. They have been simplified by the development of the new pool-type Thyratron tube, which will handle directly primary currents up to 2500 amp. without interposing of a series transformer. The controls are easier to adjust and to maintain. The control for a 300-kva. spot welder, for example, now includes only six tubes as compared with 13 of the former Thyratron control panel of the same capacity; in addition the latter needed a series transformer. Simplified control equipment was also designed for ½ cycle spot welding.

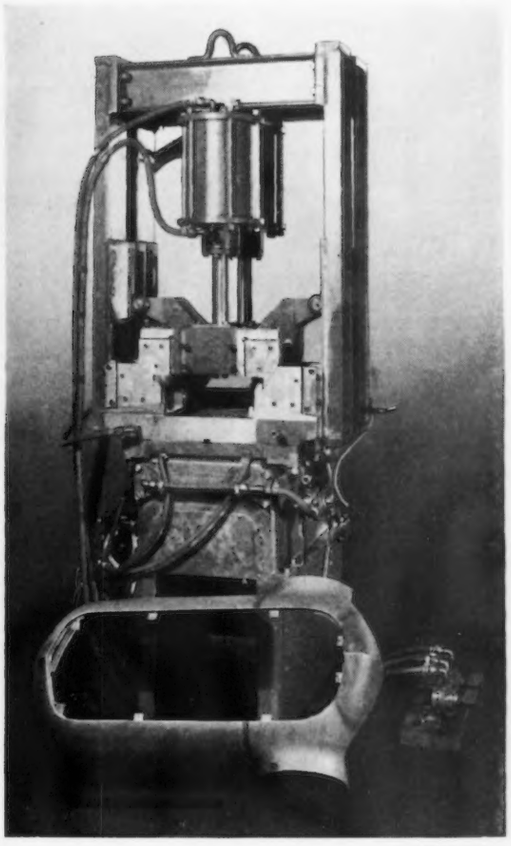
An automatic-repeat weld timer was brought out by the Electric Controller & Mfg. Co., Cleveland, for use with automatic welding machines having their electrodes operated hydraulically, by air or other method and which are designed for a series of welds along the work. It consists of substantially the same equipment as the company's non-beat automatic weld timer, but has an additional timing circuit for the "off period."

New welder controls introduced by the Clark Controller Co., Cleveland, included a welding contactor complete with mechanical timer all in one unit. This device, the type X contactor, form A, has no tubes, condensers nor complicated circuits. It has non-repeat and non-beat features. It is built in two standard ratings.

Electric Furnace Brazing More Widely Applied

ELECTRIC furnace brazing of steel parts in continuous, controlled-atmosphere furnaces has increased rapidly, and equipment for both large and small production is now available. In addition to parts for automotive construction, business machines and the like, the process is being applied in the manufacture of watches and jewelry, refrigerators, and most recently, in the making of the new all-metal radio receiving tubes.

In this method of joining two or more parts forming an assembly —such as stampings and screw machine or forged parts, difficult or impossible to make in one piece —copper or other non-ferrous brazing media are applied in wire or painted stripe form between the joints. The parts then pass continuously through a controlled-atmosphere heating furnace that also incorporates a gas-protected cooling chamber which delivers the brazed assemblies with a bright, clean surface. Any number of units can be joined into one assembly. The lowering of produc-



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THESE automobile radiator shells are made in two parts and flash welded, at a reduction in cost. In this machine, supplied by the Thomson-Gibb Electric Welding Co., special provision is made to assure alinement of the parts.

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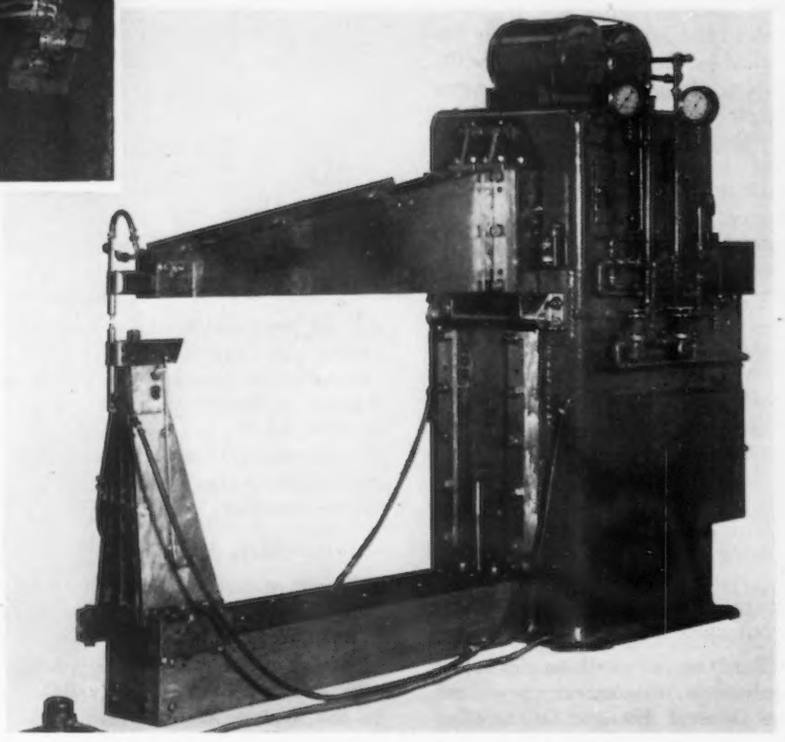
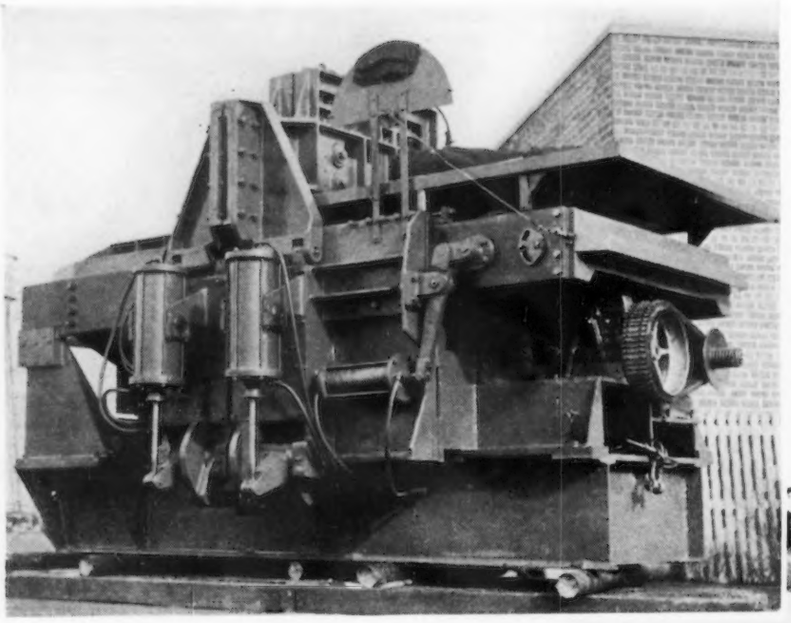
BELOW

SAID to be the largest machine built for welding aluminum, this welder has a throat depth of 72 in., a vertical opening of 36 in. and capacity for welding two pieces of ⅛-in. material. It was built by the Federal Machine & Welder Co.



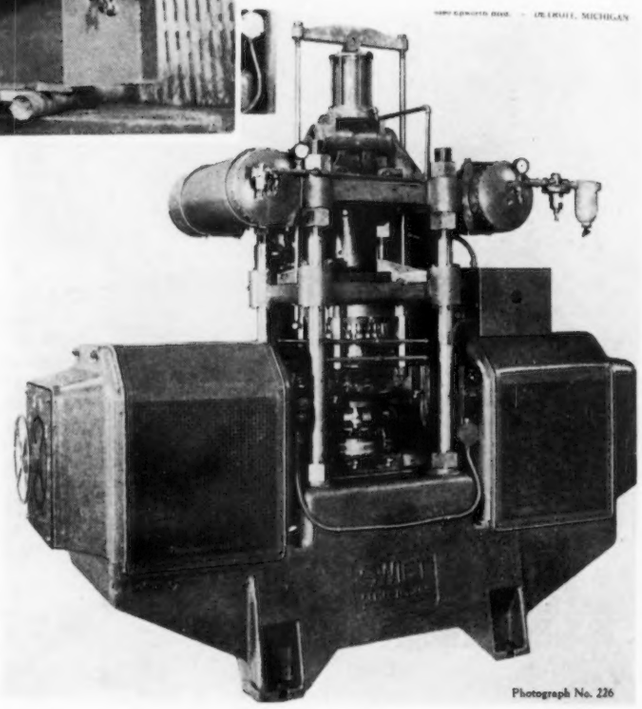


THIS flash welder, which weighs 90,000 lb., forms the heart of the production line of a burial vault manufacturing plant. Its introduction not only changed production methods, including forming, but affected the design of the vault itself. It was built by the Federal Machine & Welder Co. This view is of the machine before installation.

tion costs, as well as the making of joints of increased strength and improved appearance, has been commented on in previous reviews and in recent articles in THE IRON AGE.

Continuous conveyor-type electric furnaces for use in metal radio tube brazing have been furnished by the Electric Furnace Co., Salem, Ohio, and by the General Electric Co. The set-up furnished by the latter includes a combustion type atmosphere controller said to supply processed city gas for only $1.75 a day. The equipment brazes the special alloy eyelets of the tubes to the header, after the eyelets have been welded to the header. A ring of copper is placed around each eyelet, and then the header sub-assemblies are loaded on the mesh-belt conveyor of the furnace. The process assures a vacuum-tight seal around each eyelet. The 41 kw. continuous furnace employed has a capacity of 225 lb. gross per hr. The heating chamber is 7 ft. long and the cooling chamber 18 ft. long. Operation of the furnace is at about 2050 deg. F.

For this as well as for other protective atmosphere processes, the General Electric Co. is offering an improved atmosphere controller for processing city gas, natural gas, propane or butane. Typical equipment has an output of 4000 cu. ft. per hr. of protective atmosphere gas and the analysis of the output can be varied over a considerable range.



Photograph No. 226

SPECIAL 1200-kva. projection welder for welding 21 spots on a ring used in the construction of automobile hydraulic brakes. It is of double-transformer, post type and operates at speeds up to 60 strokes per min. It was built by the Swift Electric Welder Co.

Silver Soldering

Silver soldering is also finding wider use. A line of threadless bronze fittings having a ring of Sil-Fos brazing alloy inserted in each end has been made available by the Walworth Co., New York. The finished joint—brass or copper—is said to be stronger than the pipe itself, as well as vibration proof and corrosion resistant. Furthermore, the joint will not creep at any temperature to which the pipe can be safely subjected.

The maker of the Sil-Fos alloy, Handy & Harmon, Inc., New York, has recently brought out a new brazing alloy, termed Easy-Flo, which is free flowing at 1175 deg., said to be the lowest melting point yet developed for any brazing alloy or silver solder. A new low-temperature flux which is entirely liquid and active at 1200 deg. F. was also developed. Butt joints with the new material are said to have a tensile strength of 40,000 to 120,000 lb. per sq. in., depending upon the metals joined. Work done in stainless steels is said to indicate that very strong joints can be made at 1200 deg. F. Very little of the material is required in close fitting joints.

Hard Facing Applied in Production

NEW hard facing applications described during the year indicate a widening of production as

well as of maintenance uses. One example is the hard facing of truck and bus exhaust valve seats, said to give 10 to 20 times the mileage of ordinary cast-iron valve seats before regrinding, and another is the hard facing of the wearing surfaces of gate and globe valves or high-pressure high-temperature steam service. A manufacturer of wrapping and slicing machines is regularly hard facing long shafts at several places for roller bearings.

Steel Mill Uses Increase

Steel mill uses have increased, and a car wheel foundry is hard facing wearing shoes for molds, teeth in pit tongs, wheel cleaners and sand plows. Interesting new applications to tools and machine parts included four-cutter car-wheel boring tools, the body of which are hard faced to prevent chip wear. Torch and other building up of worn and battered rail ends is perhaps more widely practiced as the result of higher speed operation of trains.

An interesting application of bronze overlaying on to steel by the metallic arc welding process was in connection with the rocker rings on motors for the new Pennsylvania class GGI locomotives. As done at the works of the Westinghouse Electric & Mfg. Co., the bronze was deposited by means of automatic welding heads. Unusually sound overlays, entirely free from porosity, were obtained.

In addition to those mentioned above, new hard facing materials included a welding rod consisting of a steel tube, the center of which is filled with crushed tungsten carbide. It is designated by the Haynes Stellite Co. as Tube Haystellite. During the welding operation the hard, wear-resistant crushed Haystellite is bound to the surface to be covered by the steel of the tube. Although primarily for the coating of oil well bits, this hard facing material has found use also in the excavating, dredging and mining industries.

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CONTROLLED-ATMOSPHERE electric furnace brazing has had wider application and this view of the discharge end of a continuous brazing furnace is suggestive of the high production obtainable. Photo by courtesy of the Electric Furnace Co.

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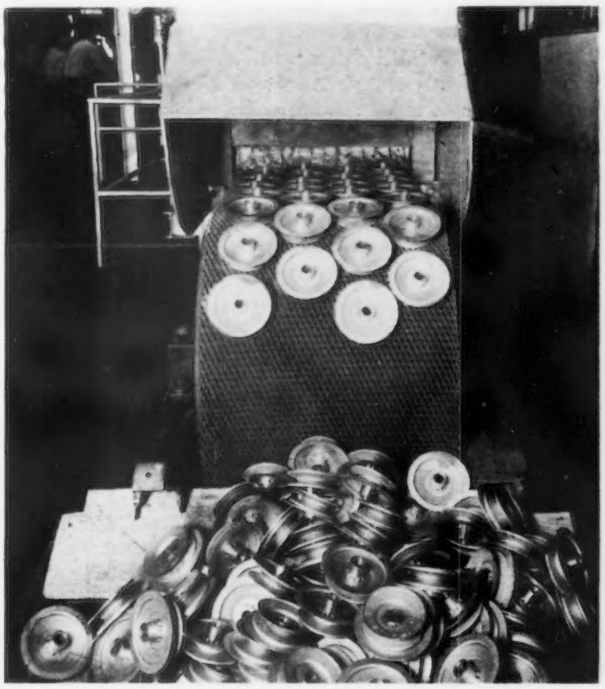

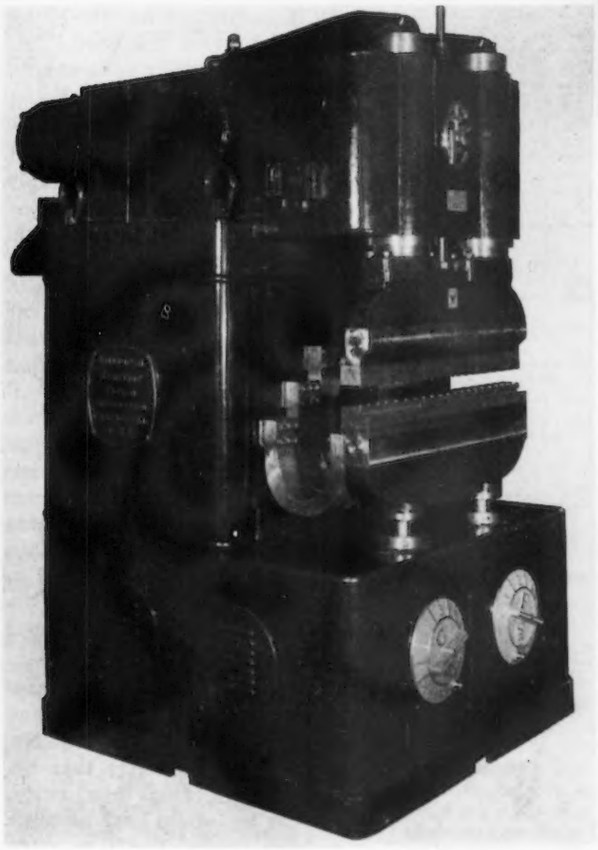

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PROJECTION welder, 600-kva., capable of welding simultaneously 21 spots over a length of 36 in. Output up to 1200 complete welds per min. is obtainable. This machine, built by the American Electric Fusion Corpn., also illustrates the possibilities of pleasing appearance obtainable with welded-steel fabrication.

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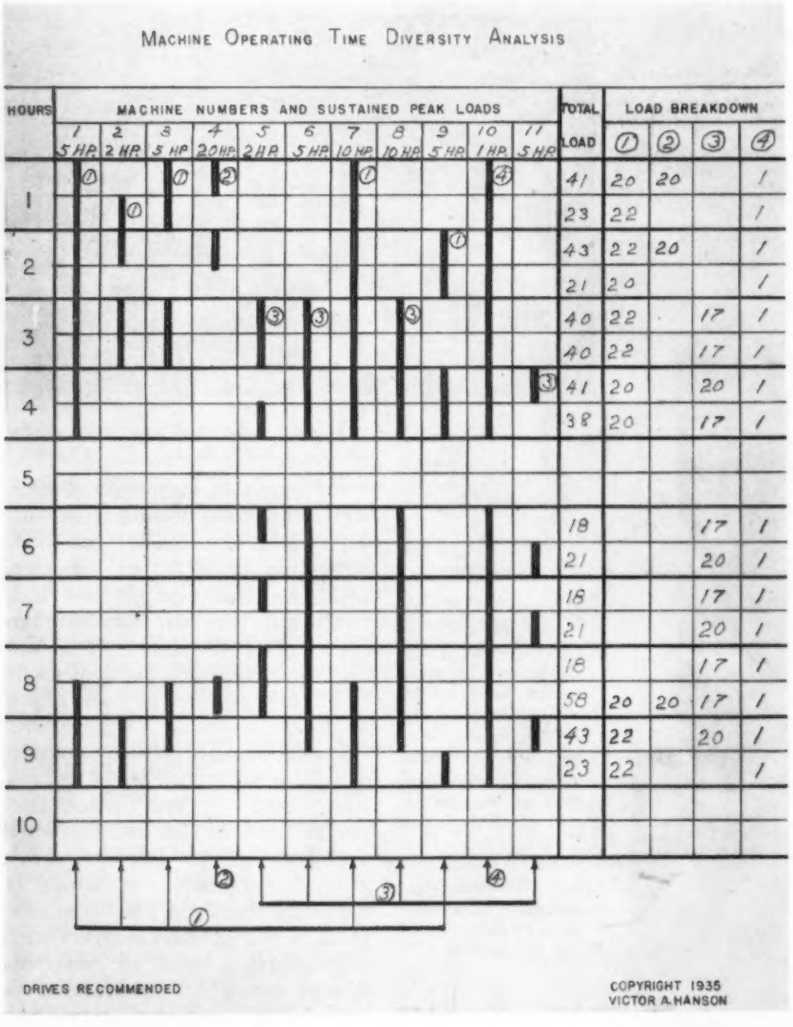
An important recent use of Haystellite has been in connection with the sinking of caissons. Steel cylinders up to 8 ft. in diameter, with saw teeth cut in one end, rotate and cut their way through earth, shale and rock. To obtain the required drilling depth of about 70 ft., the teeth are protected by a welded-on covering of composite rod containing crushed tungsten carbide evenly distributed in the steel binder. The centrifugal pumps used in this caisson work are required to handle muddy water, recirculation of which is naturally hard on the bearings. Hard facing of these bearings with Haystellite is said to have increased the pump life from 4 to 40 caissons before repairs are required. It is said that this method has shortened the usual time of sinking caissons from eight days to a matter of hours.

▲ ▲ ▲ New Profits From Planned

THE accompanying illustration of a machine operating time analysis form is designed to facilitate such a study. As shown it is filled in to show the operation of eleven machines through an eight-hour working day. By extending the form of using additional forms the study can be enlarged to cover any number of machines or any period of time.

The number of the machines together with the sustained peak loads of each machine are entered across the top of the form. Note that only the sustained peak load, or size of motor required if unit drive were applied to each machine, and that neither the momentary peak load or the long time average load is inserted, for this is a study of the diversity of machine operation only, thereby determining what machines are best operated from one motor and does not show the size of motor necessary, except in the cases where unit drive is employed. Where several machines are operated by one motor the size of that motor will usually be less than the sum of the individual sustained peak loads.



FORM for analyzing machine operating time. Machine numbers and sustained peak loads are entered across the top and machine operating time plotted on time intervals down the page. The total load is then broken down into relatively constant loads and entered at the right. The resulting recommendation of machines operated by each motor is drawn at the bottom.

The accompanying illustration of a machine operating time analysis form is designed to facilitate such a study. As shown it is filled in to show the operation of eleven machines through an eight-hour working day. By extending the form of using additional forms the study can be enlarged to cover any number of machines or any period of time.

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By plotting the machine operating time on a visible chart it is an easy matter to spot the machines which should be operated by one motor. The illustration shows the operating time of eleven machines in a department, checked every half hour. If a more accurate time study is wanted the machines may be checked more frequently, although this is usually unnecessary.

The total hp. of the department is entered in the first column on the right. It will be noted that the hp. load varies considerably during the day and therefore one motor for the department would be unsatisfactory. On further analysis by entering in the load breakdown columns the loads of the machines designated by the encircled figures, it will be seen that four motors can be applied to all operated at a fairly steady load. Machines No. 1, 2, 3, 7 and 9 when operated by one motor have a combined sustained peak load of from 20 to 22 hp. Likewise, machines No. 5, 6, 8 and 11 have a combined sustained peak load of from 17 to 20 hp. This leaves machines No. 4 and 10 to be operated by unit drive.

It is for the purpose of balancing the load between machines and weeding out such machines as No. 4 and 10 for unit drive that hp. is included in this time study. Otherwise hp. would have no place in the time study. It will be noted

Power Transmission

By VICTOR A. HANSON
Chief Engineer, Power Transmission Council and Mechanical Power Engineering Associates

Concluded from the ANNUAL REVIEW NUMBER

that machine No. 4 only operates during the time that the machines driven by the drive designated by the encircled No. one are in operation. Therefore, if hp. was not included it would be logically placed in drive No. one. Because of its relatively large load and intermittent operation it would upset the balance of that drive considerably. On the other hand, if it had a 2 or 3 hp. load it could well be fitted into drive No. one.

The reverse of the situation is true of machine No. 10. If hp. only were considered it might well be fitted into either drive, No. one or three without upsetting the load balance of the drive. But because of its continuous operation either drive operating it would be run part of the time with badly underloaded conditions. Therefore, unit drive is recommended for this machine.

Although this machine operating time analysis may appear to be complicated, it is actually quite simple in practice. For the purpose of simplicity the machine loads are represented on the analysis form by the sustained peak loads or the size of unit drive motor which would be required, for this is the easiest load information to get on any machine. It need not be absolutely accurate. Likewise the time checks are made on half hour intervals in most cases for it results in a recommendation that is fully as practicable and economical as if great detail were gone into to get absolutely accurate information. An error of 10 per cent in either direction has no measurable effect on the resulting cost of operation. Likewise occasional part-time operation which upsets the balance determined in this study, has an insignificant effect on operating cost. In the study and application of transmission, like any other industrial problem, a lot of old fashioned good judgment must be used.

Then the Materials Handling Problem

After the number of machines per motor is determined, the recommendations must be subjected to the material handling problem. This should only be done after a careful study of the material handling problem is made and the most economical method determined. The most satisfactory relation of power transmission to material handling can only be determined by an examination of the plans or layout. It may on occasion result

POWER TRANSMISSION INSTALLATION COST ANALYSIS

EQUIPMENT	METHOD A		METHOD B		METHOD C	
MOTORS & CONTROL	11	071	108	387	31	461
WIRING INSTALLED	5	717	56	019	20	125
STRINGERS					4	722
SHAFTING	6	764		36	2	636
BEARINGS & HANGERS	10	530		63	9	451
COUPLINGS	3	860		86	1	306
CLUTCHES						
PULLEYS	11	706		107	7	586
BELTING	26	717		657	20	444
V-BELT DRIVES		709	7	260	5	777
CHAIN DRIVES			4	697	2	192
SPEED REDUCERS				672		
VARIABLE SPEED TRANSMISSIONS						
ROPE DRIVES	9	761				
GEARS						
FLYWHEELS	2	350				
BOLTS & WASHERS		616		69		360
MECHANICAL INSTALLATION LABOR	8	864	1	032	5	127
MACHINE ARRANGEMENTS			10	248		
TOTAL COST	98	665	189	333	111	187

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AFTER the number of machines to the motor is determined, the installation cost of the power transmission system should be obtained and compared with other possible methods. This form is filled in with Method A representing the existing installation and methods B and C, two means of modernization.

POWER TRANSMISSION ANNUAL MAINTENANCE COST ANALYSIS

OPERATION	HOURS	COST	TOTAL COST
OIL & CLEAN MOTORS	476	.40	188 40
TAKEDOWN & CLEAN MOTORS	144	.80	115 20
INSPECT CONTROLS	71	.80	70 80
DRESS & CLEAN BELTS	1730	.40	692 00
ADJUST DRIVES	240	.80	192 00
LUBRICATE BEARINGS	152	.40	60 80
LUBRICATE CHAINS	12	40	4 80
LUBRICATE SPEED REDUCERS			
LUBRICATE VARIABLE SPEED TRANSMISSIONS			
INSPECT CLUTCHES			
CHECK SHAFT ALIGNMENT	40	.80	32 00
INSPECT PULLEYS	10	.80	8 00
MATERIALS			320 00
TOTAL			1684 00

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ALTHOUGH the cost of maintenance is of relatively minor importance, the determination of the final operating cost of a power distribution system will be more accurate, if it is predetermined. The maintenance cost of any proposed power transmission system can be easily arrived at with sufficient accuracy as shown on this form.

in reducing the number of machines operated by one motor to less than a production unit or less than the number recommended by an operating time analysis, but such cases are comparatively few. In this connection it must be remembered that in the actual design of the transmission system the mechanical drive may be placed in any position such as overhead, on the wall, on the floor, back of the machine, on the machine, under the machine, or under the floor. Also, it must be remembered that flat belt drives, V-belt drives, chain drives, speed reducers, variable speed transmissions, and any type of motor may be employed with equal advantage whether one machine or a hundred machines be operated by one motor.

Having determined the number of machines best operated by one motor, the next step becomes that of actually designing the drive. The first procedure is to determine the type and size of motor required. Many types are available for numerous conditions such as totally inclosed, vapor proof, dust proof, etc., to meet any required location problem. In the application of unit drive the size of the motor is usually determined by the sustained peak load or the starting load, keeping in mind that most motors will withstand heavy momentary overloads and slighter overloads of longer duration, and to meet such conditions, motors are available with high starting and running torques. It is seldom necessary to install a unit drive motor of a capacity equal to the momentary peak load, provided that the motor will maintain the required production speed requirements under such load conditions.

Where several machines are operated by one motor the size of the motor is nearly always less than the sum of the capacities of the unit drive motors required, due to the use of the load factor. Referring to the operating time analysis chart again it will be noted that the sum of the unit drive hp. which would be required to operate machines No. 1, 2, 3, 7 and 9 would be 27 hp. Due to the diversity of machine operation the maximum sustained peak load can only be 22 hp.

Load Variations

There is still another factor to be considered and that is the diversity of load variation between those machines which are actually running. The peak loads seldom occur together and when they do it is for only a period of short duration, so that a further reduction may be made in installed hp. This latter factor can only be determined by test. In the example given with a 27 hp. unit drive requirement and a 22 hp. requirement when the diversity of operating time only was considered, it was found that a 15 hp. motor was ample when all factors were considered.

Once the proper sizes of motors are determined, the next step is to select the proper type of drives from the wide variety of equipment now available and design those drives with ample capacity and in full accord with the manufacturer's recommendation.

Cost Cutting Principles

Where several machines are operated by one motor, a number of proven fundamentals should be observed. The application of the following principles will lead to the most efficient operation and the lowest operating cost.

1. Shafts should be supported by bearings at all points of load. This reduces shaft flexing and permits the use of smaller shaft.

2. Steel stringers should be used. Steel is selected for it is permanent and does not warp yet is easily adaptable to any desired degree of machine mobility.

3. Shafts should operate at as high a speed as the machine speed permits. This makes for greater efficiency and permits a considerable reduction in shaft weight. Shaft speeds of 900 R.P.M. are perfectly practical and shafts are

operating successfully at more than 1750 R.P.M.

4. Shafts should be relatively short, thus minimizing the possibility of misalignment through varying building stresses.

5. Speed ratios between motor and machine should whenever possible be consistent. Avoid for example a speed combination such as motor — 1750 R.P.M., shaft — 250 R.P.M., machine—400 R.P.M. A better combination is motor—1750 R.P.M., shaft—600 R.P.M., machine—400 R.P.M.

6. Utilize wherever warranted the latest developments in transmission equipment such as mechanical variable speed drives with which can be solved any speed variation problem and they are furnished with manual or automatic control regulated by speed, tension, thickness, torque, etc. Slip starting clutches which automatically pick up the load after the motor has started pay handsome dividends in the form of reduced motor capacities and reduced starting demand, when heavy starting loads are encountered. Free wheeling clutches are another development applicable in many cases where it is desired to stop the motor and allow the machine to continue rotating either through momentum or be driven by another motor if two motors are employed. Development in pivoted motor bases make the flat belt drive applicable to nearly any drive or machine condition with extremely high efficiency. The geared motor reducer, available in many types, makes possible lower installation costs and saves space in many cases. It is suitable for use with any type of mechanical drive or may be directly connected to the shaft or the machine. Practically all transmission equipment, even though old in type, has been undergoing recent improvement keeping in step with industries need for better production at a lower cost and making modernization pay dividends.

7. Install shafts at any angle to meet machine locations thereby permitting motion economy and better material handling. Avoid any attempt to keep all shafts parallel with one another or with the walls of the building.

9. If lighting is a factor install shafts at right angles to the source of light thereby presenting no measurable obstruction to light.

10. Wherever possible, operate machines by a drive direct from shaft to machine. This is accomplished by mounting clutch on shaft and carrying any type of pulley, sheave, sprocket, or gear on the clutch sleeve. By such an installation the installation cost and power losses of counter shafts and counter belts are eliminated.

11. Plan the proper use of flywheels on machines and shafts wherever pulsating loads are encountered. This provision of inertia improves the performance and life of transmission equipment as well as increasing production.

12. Use motors of as high a speed as possible, thereby reducing cost and in many cases increasing efficiency. Watch for opportunities to use synchronous motors and capacitor motors for power factor economies.

The conscientious application of these principles with good judgment will result in a power distribution system having the highest possible efficiency and the lowest possible cost.

The Acid Test of Cost

Once the power transmission system is designed it should be given the acid test of cost. Is the cost of transmission modernization warranted in savings of power and better production? Do the savings in material handling, machine mobility, motion economy, etc., warrant the increase in cost of installing and operating the power transmission system required to make those functions possible? Can a compromise in the transmission system be made to reduce the installation and operating costs of that system and at the same time provide for the major portion of the desired savings in other manufacturing functions? Those questions can only be answered by careful cost analysis and a complete cost analysis can be used to full advantage only when two or more methods of transmitting power are compared.

In making this cost analysis it

RECAPITULATION OF ANNUAL COSTS OF POWER DISTRIBUTED

POWER TRANSMISSION	METHOD A		METHOD B		METHOD C	
FIXED CHARGES	14	800	28	400	16	678
MAINTENANCE	1	848	2	785	1	684
POWER CHARGE	98	319	96	222	83	156
TOTAL	114	967	127	407	101	518
DEDUCT NET SAVINGS MADE POSSIBLE BY POWER TRANSMISSION IN:						
PRODUCTION QUANTITY			1	181	1	181
PRODUCTION QUALITY				600		600
PRODUCTION FLOW						
MATERIAL HANDLING						
MOTION ECONOMY						
MACHINE MOBILITY						
INDUSTRIAL LIGHTING						
ACCIDENT PREVENTION						
Painting				500		
TOTAL DEDUCTIONS			2	281	1	781
FINAL COST	114	967	125	126	99	737

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IN comparing any methods of power distribution the fixed charges on the transmission equipment such as interest, depreciation, taxes and insurance; the transmission maintenance cost and the actual power charge should be totaled. This gives the overall cost of the power distributed. For the purpose of comparing in advance of installation several methods of power distribution, there should be deducted from this cost the net savings which will be made possible through the power transmission system in other manufacturing functions as indicated on this form.

must be remembered that the net savings through modernization can and should be reduced to a dollar value. Likewise the operating cost and savings resulting from the modernization of any industrial function whether that function be material handling, motion economy, power transmission, or any of the others, can and should be predetermined before any installation is made. No expenditure for modernization or expected improvement is warranted without first knowing what returns will be made in that investment.

In making such an analysis the installation cost of the various available methods of power distribution should be compared. A form to facilitate this tabulation is illustrated. As shown, it is filled in with actual examples of the cost of the methods of power distribution in a plant. Method A is the cost of the existing installation. Power costs were considered high and there was an opportunity to improve production. So a plan of modernization was worked out and its installation cost tabulated under Method B.

The modernization cost was found high so on further study Method C was developed which, through utilization of the load factor, brought the entire installed cost down to very little more than that of the original installation. This variation in cost between the methods as tabulated on this chart are due almost entirely to the method employed and not to the types of equipment selected. The types of equipment shown are those selected for the various methods in this plan. Most of the types of equipment used in one method could be interchanged for that employed in another method with little or no effect on the cost of that method.

The next step is to determine the annual cost of power distributed to the machines as shown on the recapitulation form. Here it is seen that the cost of power delivered to the machines is much more than just the power bill, for added to the power bill are the fixed charges on the equipment to transmit power and the cost of maintaining that equipment. Frequently the fixed charges are more than the entire power bill and they are always more than the cost of the power lost by the transmission system.

It is seen that Method B, although actually reducing the power bill, increased the total operating costs through the large increase in fixed charges. Also Method C increased the fixed charges but not nearly so much and, through its large reduction in the power bill, reduced the total cost of power distributed.

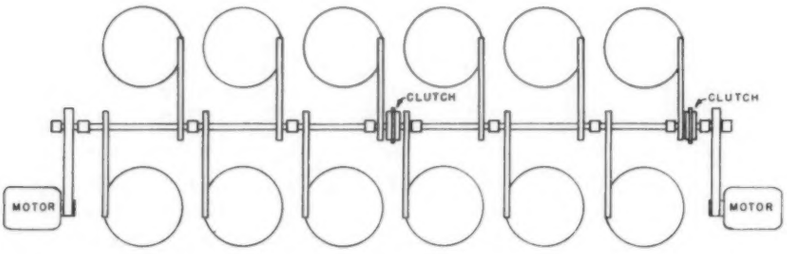
Although the cost of maintenance is of minor importance, it is frequently desirable to include it. For all purposes of cost comparison it can be determined with sufficient accuracy as shown on the form for maintenance cost analysis. In determining maintenance cost of the transmission system only the cost of lubrication, cleaning and minor repairs required to keep equipment from breaking down and to maintain maximum production should be included. The cost of major replacements which extend the life of the equipment beyond its normal life should not be included, for such costs are accounted for in the fixed charges.

The maintenance costs thus determined should be entered on the recapitulation form under the headings of the various methods, thus making the cost of power distributed for each method complete.

Recapitulation

The recapitulation form also includes space for insertion of net savings made possible in other functions directly through the power transmission system. Of course, the cost of these various functions should be carried in their respective accounts, but for the purpose of a comprehensive comparison of various methods of power distribution, the savings in any function for which any method of power transmission is responsible should be deducted from the cost of distributed power by that method. Conversely, any savings made through other manufacturing functions in which the power transmission system has no part, should not be deducted from the power distribution costs.

In the case at hand both methods A and B made possible net savings in production quantity and quality and in addition Method B made possible a small saving in painting. For the purpose of compari-



ON occasion the variation in production requirements is so great that even a compromise in production units is impossible. Here is one method of utilizing to a large degree the load factor of the machine and at the same time keeping the transmission system efficiently loaded. By engaging the center clutch and disengaging the clutch at the right, the motor at the left can operate machines anywere in the battery and be kept well loaded while the motor at the right is shut down. When load requirements exceed the capacity of one motor the center clutch is disengaged and the clutch at the right is engaged and the second motor started.

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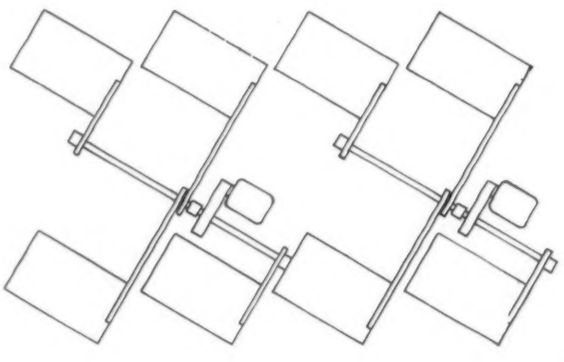

SHAFTS may be installed at any angle to meet machine location requirements. This arrangement is particularly applicable to screw machine and power press operation.

son these savings are deducted from the cost of power distributed. The transmission system in this case had no effect on other functions and therefore they are not considered.

From this analysis it is seen that the lowest overall operating cost is obtained through Method C. Had the saving in the power bill alone been considered Method B might have been adopted with a resulting loss. Although in this case the effect on power transmission is minor, frequently these other functions play an important part even on occasion, showing the lowest overall operating cost for a power transmission system having the highest cost.

To say the least, a complete analysis of all available methods of power distribution is warranted in all plants, for the economies made possible by such analysis are frequently amazing. It is because of this undeveloped field for profit that this method of analysis has been developed, to first determine the most logical method of utilizing motors with regard to production flow and material handling. Then to design the system to produce as nearly as possible the greatest economy in all of the other manufacturing functions and finally to make a complete cost analysis comparing all feasible methods of power transmission and their relation to the other functions.

An analysis such as this will pay dividends in any plant regardless of whether or not any modernization is now considered. It must be remembered that depreciation of transmission equipment continues indefinitely and that this is true even if the cost of that equipment is "written off" in the books. As transmission equipment must be continually renewed a planned power transmission system can be put into economical operation step by step as the equipment is normally renewed with little or no increase in fixed capital. But first the transmission system which will develop the desired economies must be planned for the entire plant. The sooner that such analysis and planning is put into effect the sooner will these new profits be made.

Thus are presented recommendations resulting from the study and analysis of power transmission methods in hundreds of manufacturing plants in practically every kind of industry. From such study there comes one outstanding conclusion: That power transmission is the most important single function in manufacturing and that much of the loss produced through power transmission is due to complete lack of advance planning. In existing plants, even with the best of planning, losses must be endured for lack of original planning.

Of course, it is hoped that some day a plant will be built from the ground up with advance provision for adequate and truly economical power distribution to produce the highest efficiency in all manufacturing functions under all possible manufacturing conditions. To date no such plant has been constructed. When such farsightedness becomes practice new manufacturing economies will be found and profits heretofore unattainable will be realized.

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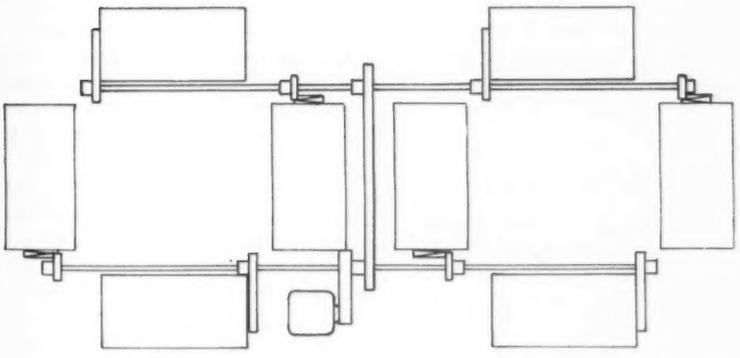

WHEN motion economy requires the special location of machines the load factor may still be utilized with resulting economy by operating alternate machines through quarter turn drives. If the number of machines per motor is large, shafts at right angles to each other and all open drives may be used.

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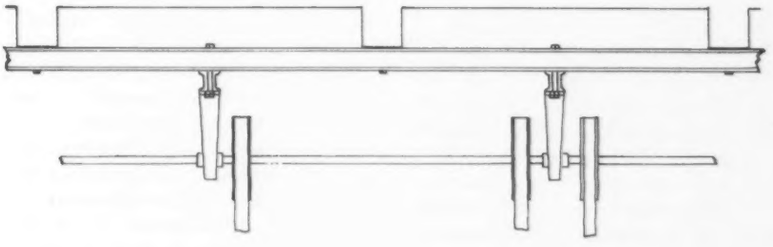

THE use of steel stringer construction as shown at the top provides for the support of the shaft at the points of load thereby reducing the size of shaft required and bringing shaft distortion to a minimum. At the bottom is a suggested stringer assembly from channels.

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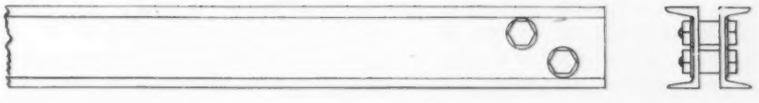


Forming and Forging In 1935

By F. L. PRENTISS
Cleveland Editor, The Iron Age

Concluded from the ANNUAL REVIEW NUMBER

ADVANCE is constantly being made along this line by men skilled and experienced in the art of forging practice. Such experience is being applied in consultations with engineers of prospective machinery builders to determine the design and production of machinery parts.

"The requirements of forged parts are many and quite varied. For instance, one may require a free machining steel, high sulphur manganese type, another a corrosion resistance steel, stainless type, a third a wear resistance steel, steel with carburized or nitrided surface, and in many instances combinations of the above qualities. While on the other hand others may require just ordinary carbon steel.

"The growing tendency for the past several years has been toward the use of alloy steel to meet the exacting physical requirements, which are becoming quite numerous.

"Progressive forge shops are equipped to heat treat forgings by quenching and tempering at the correct temperatures to obtain the physical properties with the required factor of safety, as calculated by the designing engineers. Laboratory testing equipment is available to check the raw materials as received, and also the finished forgings, to insure meeting the proper chemical and physical specifications; further, to make etch tests on sections of forgings to observe the directional flow of the metal so that the highest efficiency may be obtained from the finished products, and to a marked degree predetermine their anticipated service."

Temperature Control

The importance of closer temperature control to meet closer dimensional requirements is stressed by A. C. Johnson, president Rockford Drop Forge Co., Rockford, Ill. "To obtain proper temperature control, more is required than a mere installation of a temperature controller," he says. Since, in general, oil is the principal fuel employed, much attention has been given to burner equipment. Then, too, closer dimensions call for less scale. To accomplish this and assist in maintaining a closer temperature control, efficient automatic oil valves and recuperation are required. Much is yet to be accomplished in the field of controlled furnace atmosphere.

"Controlled grain size is not a function of the forging industry. If the inherent property of the steel is fine grain, it can be restored to fine grain by subsequent heat treatment provided the property is not destroyed through improper control in heating for forging.

"Hot coining is a very important factor in the industry today. Cold coining is necessary to complete the shapes and eliminate the draft that is impossible during the forging operation.

"Much is to be accomplished and learned of the art of forging stainless steel. However, the technique is more the concern of the steel manufacturer than the forge shop. Stainless steel has been improved in the making until at present it can be forged without much danger of destruction as has been so common in the past."

Heavier Construction

The trend in forging machines is toward larger and heavier construction and increased rigidity, and machines with greater die space and more gathering capacity. All makers are now using some kind of a friction clutch of an air operated type on the larger sizes of machines. These new types of machines have greater speed, start quicker and smoother, more quickly respond to tripping and are more easily tripped. The slide alinement is better under heavy pressures. Cushioned starting eliminates much of the severe impact from starting and this has the

advantage of reducing the maintenance of the machine. With these improvements speed of production has increased and the product is held to closer limits. Heat losses are reduced in quick acting machines. Automatic lubricating systems either built by the machine manufacturer or commercially available are now found on most forging machines.

Broadening the use of the air clutch control to vertical in addition to horizontal forging machines, the Ajax Manufacturing Co., Cleveland, brought out a new line of forging presses early in the year. These are pneumatically operated with the type of multiple disk friction clutches with which the company equipped forging presses of a new design which it offered in 1933. The frame of this press is a one-piece steel casting. These presses, ranging in capacity from 500 tons to 1800 tons, are designed for accurate hot forging work and for precision hot and cold coining of forgings.

Forging rolls of an improved design permitting wide adjustment between the semi-cylindrical dies in which the forging impressions are sunk were also brought out by the Ajax company. With this machine adjustments of 2½ to 4 in. can be made as compared with a previous 3.8 in. to ¾ in. adjustment. This wider adjustment permits a greater number of die redressings and a corresponding reduction in die expense.

These rolls are used for such work as tapering ends of spring leaves, for pointing coil springs and for blanking. While none of these machines has as yet been equipped with the air clutch control for stop motion operation, forging rolls so equipped, it is predicted, will provide a machine of much broader use in that they may be used for making an intricate type of roll forgings such as spring shackles, turn buckles and various blanks which subsequently may be furnished with a drop hammer or forging press.

What promises to be an important development in this particular forging field is a new automatic machine in which blanks are forged in semi-cylindrical dies and manual feeding is eliminated by an automatic loading device, which is timed with the operation of the machine, permitting the stock to be delivered from the heating furnace to the dies in the required frequency. This machine is designed for preliminary forging operations on automobile knuckles, connecting rods and other parts and the blanks thus formed are to be sent to automotive forge shops for the final forging operation. Machines of this type recently were placed in operation by a Pittsburgh district steel company.

Rigidity

The trend in forging equipment, the National Machinery Co., Tiffin, Ohio, points out, continues toward more rugged types of machines that produce forgings to closer tolerances than were formerly considered practical. The first major move in this direction was coincident with the development of the over-arm type heading slide that made possible the use of a short compact bed frame without sacrificing die and tool alinement. The results obtained from a forging machine that was many times stiffer than was formerly used, the company states, were so outstanding that manufacturers of this type of equipment have continued to search for ways and means to still further reduce the stretch and spring in forging machine bed frames.

The National Machinery Co. the past year improved its line of heavy duty forging machines by adding considerable metal around the die box, in providing longitudinal ribs that strengthen the bed frame between the crankshaft and the die blocks and in the crown or support for the crankshaft so that in addition to providing a more rugged support for the dies, deflection in the crankshaft under heading pressures is claimed to be practically eliminated.

Another improvement in construction was the use of an air operated friction clutch with friction slip relief pinion and new air brake. With the air clutch housed within the flywheel a compact driving mechanism is provided which is said to have increased production through its quicker starting cycle and through its continuous trouble-free performance. The air clutch is made over-sized because the machine is protected against over-loads by the friction slip pinion, which provides a safety unit that makes it unnecessary to use the clutch for both driving and relieving mechanism. This relieving mechanism acts as a tell-tale device so that in case of trouble the operator can determine whether the machine is being overloaded or the clutch is slipping prematurely.

The air clutch and brake are operated by a dual control valve that releases one unit before the other is engaged. This prevents dragging action on either the clutch or brake in starting or stopping.

A cushioned friction drive is featured in a new all steel forging machine recently brought out by the Acme Machinery Co., Cleveland. The advantages claimed for this machine include the production of better forgings and lower maintenance costs. Another new feature is a sliding head movement for operating the header slide, which is said to increase power and to make the machine more efficient.

The bed is a one-piece steel casting. Clutch disks are of aluminum alloy to give the advantage of heat conductivity. With the new mechanical features this machine starts quickly so that production is more rapid. Consequently heat loss is reduced and it is claimed that sharper and more accurate forgings are produced.

Drop Hammers

The recent trend in drop hammer construction has been toward greater power and accuracy, higher speed in production, machines more economical to operate and increased safety. The trend in design in modern machines has been in the direction of high ram speeds, giving exceedingly rapid withdrawal, according to R. E. W. Harrison, sales manager Chambersburg Engineering Co., who states that recent research work on the plastic flow of metals has determined the most effective ram speed. Cylinder bores have been reduced in diameter and the increased stresses have made it necessary to redesign the balance of the hammer both structurally and metallurgically. The structural improvements include enlarged wearing surfaces and the addition of considerable weight to the anvil. On production forging jobs it has been found economically desirable that the ratio of falling weight to the anvil assembly weight be not less than 25 to 1. The present-day production requirements for forg-

ELECTRIC FURNACE CO. installed this pusher type continuous furnace which feeds billets to the Erie hammer.

ings are summarized by Mr. Harrison as follows:

Minimum machining allowance consistent with proper cleaning up of finished surface.

Consistent and easy machinability.

Controlled flow of metal fibres (grain flow) to secure predetermined strength, and wearing qualities.

Accurate sizing and locating of all surface which otherwise would require machining.

Minimum wastage of material, i.e., small stub and flash.

Minimum number of actual forging and straightening operations.

Speed, precision, reliability and safety for the operator insofar as the forging medium is concerned.

Hazards in the operation of forging hammers have been reduced to a minimum, states Mr. Harrison, and these safety built-in features aid in the continuity of production.

"One of the most important factors which has resulted in present accepted forging practices," says Mr. Harrison, "is die design and improved die steel.

"The dies for many modern forging jobs are made with 3 degrees of draft, whereas but a short year ago it was exceptional to find any forge shop man who would sanction anything less than 7 degrees draft. It will be readily realized that this change has materially reduced the number of cubic inches of metal removal which was formerly thrown up against the machine shop.

"The transition from 7 degrees to 3 degrees draft practice was only made possible by the use of forging hammers with accurate alinement maintained between top and bottom dies and the ability to strike a blow with quick get-away which is more in the nature of a smart rap than the dead falling weight type blow which characterized earlier designs of hammer."

The importance of having a forge shop laid out so that the flow of work to and from the forging equipment is in an uninterrupted stream is stressed by Mr. Harrison, who says that this is desirable from the point of view of orderly work process, but also highly desirable from the metallurgical viewpoint, as the more commonly used batch method of producing forgings results in unjustifiable variations.

Drop forging equipment produced during the last two years, he said, is capable of an average of 30 per cent improved economy in steam consumption and has production rates of from 10 to 40 per cent in excess of the rate available on forging equipment designed five years ago. With continuity of production, reduction in maintenance costs, the advantages of up-to-date furnace practice, production costs in many cases have been reduced as much as 50 per cent.

Steam and Air Hammers

"There has been a great deal of interest during the past year in the operation of steam forging hammers and steam drop hammers on compressed air, although there seems to have been more study and planning done than actual changing over to air operation," states Macdonald S. Reed, sales engineer Erie Foundry Co., Erie, Pa. The proportion of drop hammer sales as compared with steam hammer sales continues to show a slight increase, he says. Mr. Reed states that there were no startling technical developments in forging equipment last year, although there have been a number of improvements in details of construction in both steam drop hammers and board drop hammers. The volume of hammer business, he states, was quite satisfactory during the year. A large part of it has been for replacement of obsolete equipment. "There is a very apparent appreciation on the part of the forge shop," says Mr. Reed, "of the fact that about 80 per cent of their equipment is obsolete and cannot compete from a forging cost standpoint with the present-day machines."

Among the notable installations of drop forge equipment during the year were four Chambersburg steam drop hammers each of 12,000 lb. capacity, that were built for the Buick Motor Co. for forging crankshafts. These handle 4 in. x 4 in. billets weighing 220 lb., producing a heavier forging than heretofore had been made in the Buick plant. With these improved hammers the crankshafts are forged to close limits, cutting down the amount of scrap and the machining cost. A new practice at the Buick forge shop is to hot pierce all transmission gears.

Forging Furnaces and Billet Heating

A great deal of study has been given to the proper heating of forgings, the results of which are reflected in improved physical properties. Buyers are demanding positive heat control and the forging temperature of the steel is being held to within a closer heat

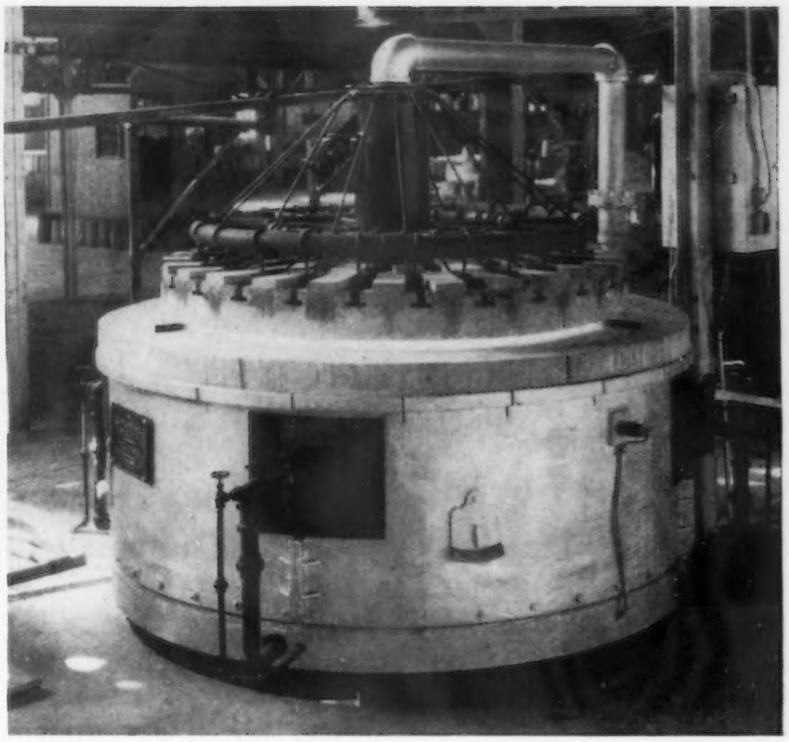
range. The importance of imparting to the billet the correct degree of heat for the proper length of time is being stressed. An important field of research in the forging industry is to determine the pressures required to forge various steels at different temperatures, declares one manufacturer of forging equipment, who states that complete research along that line has never been made.

While automatic temperature control has been installed in many furnaces, a majority have not been so equipped, operating temperatures being governed by the skill of the operator. Automatic control of the temperature can be employed with slot type furnaces, but it is stated that the result is usually not practical from a production standpoint.

There is no definite trend toward the use of controlled atmospheres for forging furnaces. However, more attention is being paid to controlling the volume of air to produce a reducing atmosphere in order to increase oxidization and the danger of burning.

Continuous automatically controlled heating furnaces are to some extent replacing the slot type furnaces for heating forging stock, but these are confined almost wholly to production work. These furnaces of the pusher or rotary type are suitable where the work is heated overall, but are not adapted for heating where only the end of a piece of stock is heated, as is generally done for upsetting work on the end of a bar on forging machines or hammers.

However, a novel type of rotary furnace, which is shown in the photo, has been designed. The entire furnace, including the burners, is carried on wheels and revolves. The pieces to be heated are placed on a slot at the top of the furnace with their inner ends projecting over the combustion chamber. The furnace illustrated is gas fired, although oil may be used. On making the circuit the piece is removed by the operator who places it within convenient reach of the forging machine or hammer. Automatic control holds the furnace at any desired temperature and prevents overheating of the work even if the piece is kept in the furnace longer than the normal heating period. A variable speed device regulates the speed of rotation of the furnace chamber.



CONTINUOUS electric rotary forging furnace built by Electric Furnace Co.

The use of furnaces with automatic temperature control results in a marked reduction in costs in heating forgings as compared with the slot type furnaces, according to data obtained in a survey conducted by the Electric Furnace Co. This saving results from reduction in fuel consumed, increase in production and lower labor costs. This increase in production is said to be from 40 to 200 per cent.

Recent furnace installations include one of novel construction which discharges billets through a chute directly to the hammer man and thus eliminates the heater. The furnace is supported above the floor, and pushers move the pieces through the furnace in V grooves and delivers them onto the discharge chute one at a time. This furnace will handle 4 x 4 in. pieces up to 6 in. long.

When continuous furnaces cannot be used because of the size of the piece or the nature of the heating required or because of intermittent production, Multidoor batch furnaces of various types are being used.

Dies and Die Steels

Composite dies and die inserts are being more generally used resulting in considerable saving in die costs. Composite die steels are made in numerous types to meet various requirements.

Three methods are now in use for making composite die steels. The oldest and simplest is the shrinking of a circle of mild steel around a body of tool steel, the former first being expanded by heating. The second process embraces different assembly methods which are variations of the welding process. Various compounds have been developed to cement two dissimilar metals or alloys. Of particular significance is the use of pure iron in the sheet form or as an electro deposited coating to effect a good weld. In this case the pure iron deposited on the alloy welds readily to the mild steel and at temperatures which do not destroy the structure of the alloy. Composite steels made by the assembly method may be rolled in a mill or forged under a hammer. The third process, designated as the casting process, consists in placing an alloy steel insert in a mold and casting mild steel around it. The ingot is then rolled to the desired shape. The Jessop Steel Co., a pioneer in composite die steel, uses the casting process whenever possible because it permits of lower costs. Applications for composite die

(CONCLUDED ON PAGE 87)

THIS is a "before" picture. It shows extremely low illumination (4.9 foot candles), wrong positions of fixtures and the work in deep shadows.

Plant Equipment

Concluded from the ANNUAL REVIEW NUMBER

FEW industrialists have wholly neglected the matter of drinking water. Most of them fully appreciate the necessity of an adequate supply of pure water but many installations are now in use that are out of date and do not represent the best practice which contributes the utmost to the needs and comforts of the employees.

The problem has not necessarily been solved satisfactorily when water, though pure, is piped to drinking fountains. In warm weather the tendency for the workman is to tie the valve open so that he can have a cool drink. This practice is wasteful of water. If the valve is not tied open then the worker will stand by holding the valve open until he figures that the water is as cool as it will come from the city mains. The net result is lost time as well as waste of water and after all the workman has not had a satisfying and stimulating drink if the day is hot.

Some plants were modern 10 yr. ago when circulating systems extending long distances were put in operation. Cool water is furnished at the fountains but line losses will bear study in view of more modern developments.

Modern practice now calls for pure, cool water, with fountains located so that no workman need walk more than 100 ft. for a drink. The plan of the cooling system should be such that the water will run cool within the time the man turns on the valve and bends over for his drink. This practice saves time and water. The matter of the type of cooling system varies according to conditions. Old central cooling plants, feeding through long lines to separate buildings are being taken out.

If the old circulating pipes are in the walls then one or more circulating cooling units will be put in each building, using the old pipes in the building but doing away with the long runs between buildings and the central cooling plant. Or, new building unit circulating systems may prove to be economical.

Unit Coolers

Unit coolers are finding increasing use in factories. One fountain is at the cooler and a lead can be run up not to exceed 25 ft., for the best practice, so this one cooler serves the fountain on the floor directly above.

Legislation looking toward pro-

THE same department as shown at left after illumination was raised to 40-foot candles and the fixtures were properly positioned.

nt Enters New Era

BY ROGERS FISKE
Western Editor, The Iron Age

tection of workingmen against dust hazard is rapidly spreading throughout the states of the Union. The matter of dust prevention and elimination is first of all one of good housekeeping. The next step is that of the proper selection of equipment for the removal of dust. The use of properly designed hoods is one of the first steps for gathering dust, the character of which will determine the velocity of the air at the hood opening. For foundry practice a velocity of about 275 ft. per min. is often recommended.

Hood pipes in which the air velocity is 2500 ft. per min. or somewhat higher prove adequate in foundry service. Branch lines should enter the side of the main and the least possible number of long radius elbows should be used. Pipes that incline downward in the direction of air flow are subject to clogging.

Dust Collection

The subject of dust collectors is a broad one. For purposes of general classification there are the following types; cloth screen or bag, washer, centrifugal (with or without a fan), electrical precipitation and froth-flotation. The use of one or another type cannot be generalized. Conditions most often dictate the type.

Study of dust characteristics involves grain size, percentage of the various sizes of particles, moisture, specific gravity, amount of sticky substances, the degree of fineness and temperature.

Consideration must also be given to the manner of disposal of dust after it is collected. The coarser materials will usually not give trouble but fine dust often presents difficulties in transporting it from the collector to the point of ultimate disposal. Sometimes this can best be handled by adding water, making a sludge which can be pumped to the dump.

In northern climates shop buildings are enclosed and they are often in densely populated areas. This imposes conditions which demand more thorough collection and removal than is the case in southern climates where open type buildings and maximum natural ventilation can be effectively used.

Vacuum cleaning in industrial plants is an economical and effective method of reducing health, fire and explosion hazards and for removing refuse and loose raw materials. The equipment may be

STEEL shelving and metal furniture contribute to more effective handling and storage, and reduce fire hazard.

had in a number of sizes of portable units and it may also be installed as a central cleaning system. The vacuum system has the advantage that it raises no dust, as do brooms and brushes, and it therefore can be used for many purposes during working hours without either discomfort to employees or harm to products which must be protected from dust.

Vacuum cleaning is fast as shown by the fact that a man covers large areas at a walking pace and all dirt is removed even from cracks in the floor. This system finds application in the foundry for picking up sand, in many industrial plants where dust should be removed from walls, pipes, roof trusses, the tops of furnaces and hoods, and in and around conveyors. It is effectively used for the removal of soot from boiler flues. The cleanliness afforded by the vacuum system is often essential in processes where the finish is of great importance. In some instances vacuum pipe connections are carried to the tips of cutting tools to remove cuttings that otherwise would pile up at the machine. This system is also used to reclaim excess dust which is highly valuable.

Piping Layouts

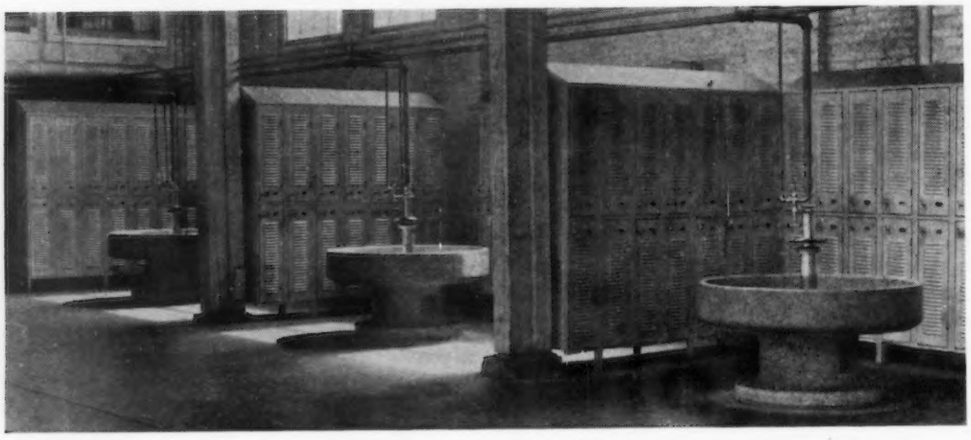
Piping layout is as important as is the selection of the mechanical and electrical equipment. The proper location of flexible sleeves and clean-out plugs is important. Incorrectly made joints and other connections can make ineffectual what would otherwise be a satisfactory installation.

All pipe fittings should be of the long turn drainage type with recessed threads. Steam, gas or water fittings are absolutely unsuitable for vacuum cleaner piping. Nothing smaller than 2 in. pipe should be used anywhere in the system. The only exception to this rule is that sometimes 1½ in. nipples and couplings may be used for connecting the inlet valves to the piping system. This procedure is not recommended, however, unless it is absolutely necessary on account of space limitations. Exhaust connections should be made to the chimney or flue and have no other openings above them.

One of the important industrial problems is that of building maintenance. This involves keeping the building up to par as to usefulness and there is also the matter of pride which dictates that a building if well kept reflects credit to the management and the neighborhood. In fact, well maintained buildings are a mark of success.

Of first importance to the outside of a building is a good paint job that is repeated often enough to assure protection against the elements. Paint on the interior is a matter of neatness, cleanliness and the proper reflection of light, as well as protection against destruction from gases and fumes emitted by many processes.

Many industrial plants have a



WASH fountains and lockers contribute to the comfort and convenience of workmen.

paint standardization plan developed after a study of the various problems of maintenance and upkeep. Such a plan will readily be given full cooperation by any reliable paint manufacturer. From this study standardization charts, showing colors for the different surfaces and listing and numbering the various materials can be prepared.

The problem of maintenance means not alone protection of a structure against destructive elements but also such matters of cleanliness and neatness. This subject then has to do not only with window washing as a matter of appearance but also as an effective way to take full advantage of all possible day light. The accumulation of dirt on window panes will in a few months exclude 25 per cent of the light and half a year's accumulation may cut effectiveness fully 50 per cent.

If only sidewall window lighting is available the glass area should be about 30 per cent of the floor area. Skylights and monitors become imperative if daylight is desired at and near the middle of wide bays. The use of well designed and properly spaced monitors will permit 25 per cent reduction of the total percentage of window area to floor area.

Shelving

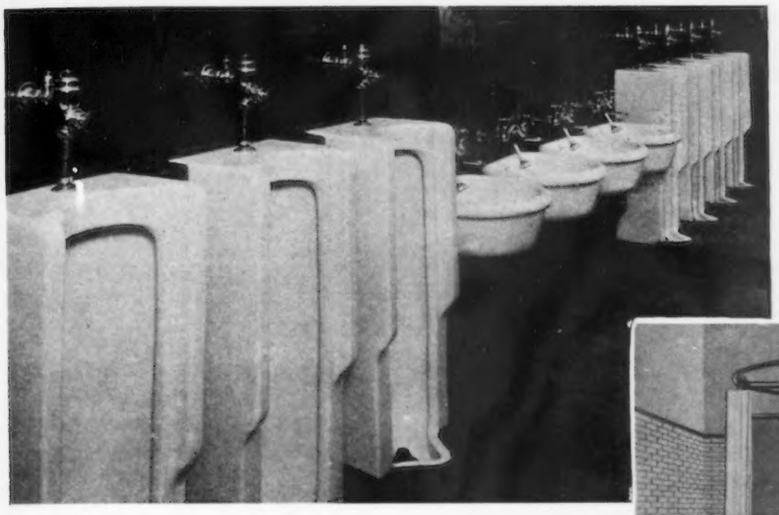
Two essentials for the modern industrial building are steel shelving, bins and steel lockers. They are important in the matter of reducing fire hazard. Finished and semi-finished parts, as well as raw materials represent an actual investment of cash. Wastage of parts, the loss of parts and inefficient handling and storing methods add to production costs. Steel shelves and bins properly laid out so that parts and materials are easily located, orders quickly assembled and requisitions correctly handled mean money in the manufacturer's pockets.

The newer types of lockers are durable, efficient and quiet in operation. They afford the worker a safe place to store his personal belongings while working. Steel lockers actually improve morale in a plant and they serve another good purpose in improving the appearance of a plant.

Another paying investment is that for washroom equipment. Clean and adequate washrooms do not mean expensive equipment and high upkeep. The points to be kept in mind when planning this department are economy of floor space, water consumption, durability and sanitation. There must be sufficient equipment so that over crowding of the room does not occur.

While many plants provide washroom fixtures and other general sanitary equipment the comfort of workmen in the matter of clean and adequate showers is entirely overlooked. The matter of type of shower is somewhat that of preference and available floor space. A group type of shower is available which saves floor space, is economical to install and is free from dirt collecting corners and pockets. Valves for showers can now be had which permit water to be tempered to any desired degree and at any pressure. The design is such that sudden changes in water temperature, with subsequent danger of scalding, are practically eliminated.

When all is said and done the modern industrial plant is designed, constructed, operated and maintained for the purpose of better operating methods and conditions, lower costs of production and maintenance, convenience and comfort for employees and as a source of real pride to community, owners and workmen.



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AT LEFT

WASH and toilet rooms must not only be clean and neat when first opened but must be maintained in that condition.

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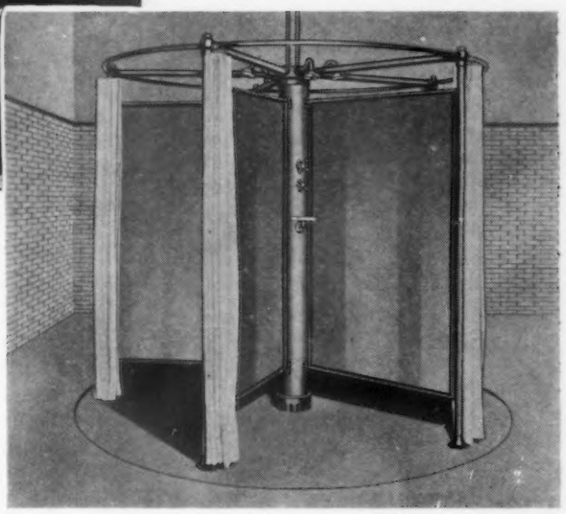

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AT RIGHT

SOME types of showers are floor space savers and there are no corners in which dirt can collect.

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Metal Finishing

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By HERBERT R. SIMONDS
Vice-President, Metal Products Exhibits, Inc.
Rockefeller Center, New York

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BRIGHT nickel plate has some advantages other than the elimination of buffing. When it is desired to retain characteristics of the base metal, such as matte effects, this can be more readily done by using the bright nickel undercoat. The Pyrene Mfg. Co. has developed a method of electrodepositing iron at the rate of 0.020 in. per hr., which means that several new fields for plating soon will be opened up. The deposit itself may be heat treated, and the company has had considerable success experimentally in producing ferrous alloy plates.

The American Brass Co. reports completion of a satisfactory method for rapidly producing patina on copper. This is the result of research work started some years ago by the Copper and Brass Research Assn. A new pamphlet gives the practical details of the process.

Other coloring processes have been developed, notably blue and black on brass, and bronze on copper.

From the Colmonoy Co. in California comes the report of overlays of metallic boron crystals on steel to produce exceptionally hard surfaces.

Cadmium plating came to an impasse in 1935 because two automobile companies started using cadmium bearings, and thus upset the balanced supply and demand of the metal. The price of cadmium nearly trebled and most platers turned to substitute finishes. E. I. du Pont de Nemours and Co. announced a practical electroplating process for production of bright zinc surfaces on steel. Deposits up to 0.003 in. are claimed.

The Grasselli Chemical Co., Inc., also has developed a new zinc plate to replace cadmium. The process is said to operate at current densities and current efficiencies equal to and even higher than those used with cadmium solutions.

Use of Alternating Voltage

Much interest has centered around the use of an alternating voltage current in electroplating of alloys. In cases where one metal plates better at one voltage and another at another voltage, it has been found possible by using anodes of the alloy of the two metals and then using an electric current with rapidly changing voltage to plate both metals simultaneously. This process is still largely experimental, but definite practical achievement is predicted for 1936.

A non-corrosive alloy plate on cast iron is reported by the Electrodeposit Corpn. This consists of tungsten and nickel deposited simultaneously from the same electrolytic solution.

The Metalkote Co., Inc., has introduced a new process of coating steel and other base metals. It consists of applying, usually by spray gun, a solution of the coating metal, usually aluminum, and then by subsequent heat treating to create a suitable bond between this coating and the base metal. The coating, it is claimed, approaches the character of an electroplate.

The use of bi-metal construction to secure the strength and/or low cost of one metal with the corrosion resistance of another was extended in many fields during the past year.

One type of construction previously described is the clad metals such as nickel-clad of Lukens Steel Co. A new type is that of the A. O. Smith Corpn. wherein a thin lining of stainless alloy is spot-welded at frequent intervals to a steel plate tank or vessel.

Many refinements in the composition and fabrication of 18-8 stainless steel have been made during the year. One of these is the addition of columbium, which is said to eliminate intergranular corrosion when the alloy is exposed to corrosive chemicals at high temperatures. The Electro Metallurgical Co. announces that it is now prepared to furnish ferro-columbium for making this addition.

The American Nickeloid Co. reports the development of several new finishes. One of these, known as gold bond, is a plate which closely resembles the color of real gold. It can be finished on base metals of steel, zinc and tin plate, and can be used for bracelets and ornaments with alternate bright and satin patterns. To better protect pre-finished plate against forming tools, the company has developed a gummed paper to apply over the polished surface. It is of such a nature that it adheres during forming, yet when the work on the metal is complete, the paper peels off leaving the high polish uninjured. Some of the products which have been fabricated during the past year out of pre-finished material include automobile heaters, washing machines, toys, lamp fixtures, vending machines, and display stands.

Outstanding in the foreign achievements for 1935 was the completion of a commercial process for

Advanced in 1936

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turning out chromium-plated strip on a continuous basis. This has been done experimentally in the United States, but as far as known no commercial unit is in operation. Europe has been affected the same as this country has by the shortage of cadmium created by the American automobile manufacturers. As a result, there has been a trend toward substitution, and many laboratories are now actively at work on new bright zinc and aluminum-alloy finishes.

Lacquer-Improvements

Great stimulus has been given to lacquer manufacturers by the demands of the automobile industry, but even so the improvement in lacquer properties during recent years forms one of the most noteworthy achievements of industry. The Roxalin Flexible Lacquer Co., Inc., reports several recent additions to its line. One of these is a non-absorbent surfacer known as Filloid which was developed in England. Another is a baking lacquer to withstand the chromium-plating operation. Metal parts finished with this lacquer may be buffed to remove the lacquer at high lights or other points, and then the entire part may be put through the chromium-plating sequence to cover the bare surfaces with an electroplate. Original designs and unusual effects are said to be possible by this means.

Especially intended for large machine castings is this company's new red oxide primer. Parts finished with this primer may be placed in the yard for several months and still be in good shape for the finish coats.

The year 1935 has brought a return in demand for gold and gold-like finishes in costume jewelry and novelties, according to the Zapon Co., which company has developed a line of lacquers to accurately match different grades of gold. Thus, one may order a 14-carat or a 22-carat lacquer for buckles or bag trim and it will match the appearance of the corresponding solid gold.

The O. Hommel Co. reports a trend in the porcelain enamel industry toward leadless cast-iron frit and super-opaque one-coat frit for steel. This company has designed an apparatus for the accurate measurement of specific gravity and viscosity of porcelain enamel. It also has a new frit for black edging, said to eliminate crawling and reboiling and to avoid running together of the the edge and cover coat.

New acid-resisting frit has been developed especially for application over colored porcelain enameling. The new frit is clear as transparent glass, and thus leaves the underlying colors unchanged. It is intended especially for outdoor use where colors are used so extensively in sign and display work. As a result of research work at the Mellon Institute of the University of Pittsburgh, the company reports a new enameling process which gives a coat so opaque that the usual first coat is unnecessary. It is said to give less cracking or crazing, and a smaller percentage of rejects. This new process is called Hommelaya.

Ferro Enamel Corpn. reports progress in the production of tougher and more opaque enamels. This cuts down the required thickness of coating, and therefore results in an overall saving, particularly where there is automatic equipment and mass production. During the year, this company has completed new smelting plants in England and France.

Ault & Wiborg Corpn. has developed several new products intended especially for use on automatic spray-coating machines. One line known as lithocrome gives metal an attractive appearance, usually black or gold, and at the same time an unusual resistance to the action of acids, alkalies, and solvents.

An important protective coating for metal has been developed by the Watson-Standard Co., known as plicote, designed particularly for resistance to acid or alkali. The company states that many of the physical qualities of this new coating are similar to those of rubber, yet it should not be confused with rubber paints. It is said to be resistant to deterioration from heat, and thus to give satisfactory service on smoke-stacks, stoves, drying racks, ovens, and similar surfaces. One grade of plicote is claimed to resist hydrochloric acid, nitric acid, sulphuric acid up to 50 per cent concentration, and nearly all alkalies.

The Porcelain Enamel & Mfg. Co. brought forth a new lead-free white porcelain enamel for cast iron, claimed as more opaque than previous enamels for this purpose and as providing a finish on cast iron which will accurately match the enamel finishes on sheet steel.

Finishing Equipment

Whatever the properties of a metal finish, its use in industry is dependent in the last analysis on equipment, and certainly this

branch of the finishing craft deserves much credit for the fine finishes now universally available on relatively low-priced products. N. Ransohoff, Inc., states that the stimulus in interest in metal finishes has been reflected in their development and sale of finishing machinery. This company is now building what is believed to be the largest continuous drum-type washing machine ever built. The drum itself is 48 in. in diameter, and 26 ft. long, and is designed to wash, rinse, dry and oil-spray metal products. The arrangement is such that a power loader discharges work onto a vibrating pan which then feeds it at the proper rate into the drum. "We find," this company states, "that cleaning operations are being systematized in the same way that other production operations have been heretofore, and we find less and less dependence on the rule-of-thumb methods."

The DeVilbiss Co. reports an increase in interest in finishing equipment, and states that improvements in this field have been made in speed, efficiency and safety. One interesting development is the down-draft spray booth, making possible certain new adaptations of spray painting to the continuous process of production. One such adaptation involves two swinging arms with spray guns mounted on the lower end. These swing back and forth in opposite directions over the product to be sprayed. During the past year one of the large steel companies installed spraying equipment in place of old-style petcocks in the application of oils to cold-rolled sheet steel during rolling, and by so doing saved about 50 per cent of the oil and produced a better appearing sheet, due to the application of the spray to both sides of the sheet.

The Paasche Air Brush Co. brought out a new air brush with detachable multiple heads which is said to give better service than previous models. This same company has developed an automatic air-cooling and drying machine with five automatic air guns mounted on oscillating devices. The drying oven is electrically heated with thermostatic control, and the capacity is 60 pieces per minute with 300 deg. F., with drying time from ¾ of a minute to 1½ minutes. An adaptation of this combination unit was made for enameling metal radio tubes.

The B. F. Goodrich Co. developed during the year a product known as korolac, which is a synthetic rubber-like material intended for coating by dipping such metal products as electroplating racks and other electroplating equipment. The coating, according to report, holds its position because it shrinks on cooling and it has the following advantages — translucence, corrosion resistance, and high dielectric strength. It is said not to be affected by chrome, cadmium, zinc, copper, brass, or tin-plating baths, and to withstand alkalies, sulphuric acid, nitric acid, hydrochloric acid, hydrofluoric acid, chromic acid. A temperature of from 230 deg. F. to 250 deg. F. is required to bring korolac into condition for dipping, and the dipping tank must either be porcelain or glass-lined, as no other material is satisfactory. However, electroplaters, having once installed equipment for coating this material, may easily make up and

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ABOVE

LARGE rubber-like pickling tanks have moved into production lines during the year.

(Courtesy of B. F. Goodrich Co.)

THE lacquer finish on these die cast boxes is a crystalline formation resembling inlaid leather.

(Courtesy of New Jersey Zinc Sales Co.)

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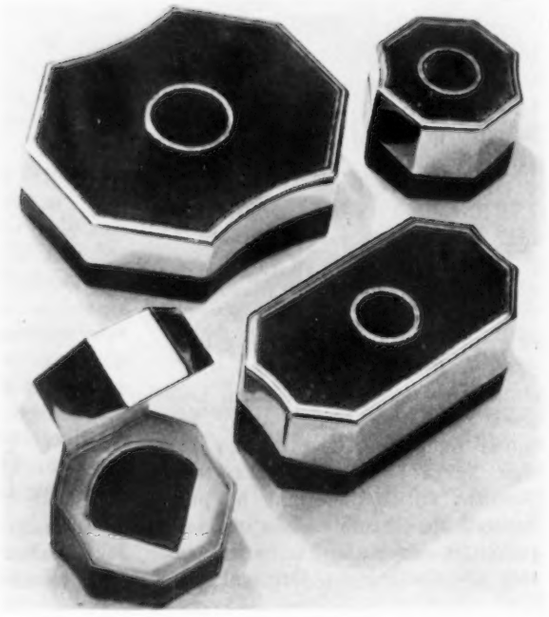


Specifications adopted in 1935 for electro deposited coatings of nickel and chromium.

Base Metal	Type of service	Min. Thickness Cu Ni	Min. Thickness Final Ni	Av. Thickness Chromium	Salt Spray Hours
Steel	General	0.00075	0.00040	0.00002	48
	Mild	0.00040	0.00020	0.00002	12
Brass, Bronze and Copper	General	—	0.00030	0.00002	—
	Mild	—	0.00015	0.00002	—
Zinc base die casting	General	0.00060	0.00030	0.00002	—
	Mild	0.00045	0.00015	0.00002	—

For copper and nickel the rate of deposit varies with conditions and efficiency. For acid baths with 90 per cent efficiency, 21 amp. hr. per sq. ft. is specified. (In the cyanide copper bath the rate will not exceed 10 amp. hr. per sq. ft., if the efficiency is to be held over 90 per cent. Usually the efficiency is allowed to drop to give the 21 amp. hr. rate.) In depositing chromium, a rate of 500 amp. min. per sq. ft. gives about 12 per cent efficiency.

Specifications tentatively adopted in 1935 for electro deposited coatings of zinc and cadmium on steel.

Base Metal	Coating	Type of service	Min. Thickness
Steel	Zinc	General	0.00050
—	—	Mild	0.00015
Steel	Cadmium	General	0.00050
—	—	Mild	0.00015

To deposit 0.0001 in. of zinc with high efficiency requires about 14 amp. hr. per sq. ft., and to deposit 0.0001 in. of cadmium with high efficiency requires about 10 amp. hr. per sq. ft.

cover their own racks and pickling equipment. The company has improved its system of rubber-lined pickling tank construction, by which adjacent alternating layers of hard and soft rubber are employed to resist abrasion, and tank expansion and contraction. The company has designed acid-resistant rolls intended for carrying steel sheets from one acid tank to another, or from acid to rinse tanks. These rolls are constructed with a rolled steel shell with cast neck and journal assembly.

Cincinnati Milling Machine and Cincinnati Grinders, Inc., report increased interest throughout industry in better finish of parts, which is reflected in a demand for rugged high-quality grinding and polishing machine tools.

Ampco Metal, Inc., reports an increased use of its metal for dies for drawing stainless steel wire, in order to give the wire a better surface.

Private Investment Is Key to Capital Goods Revival—O'Leary

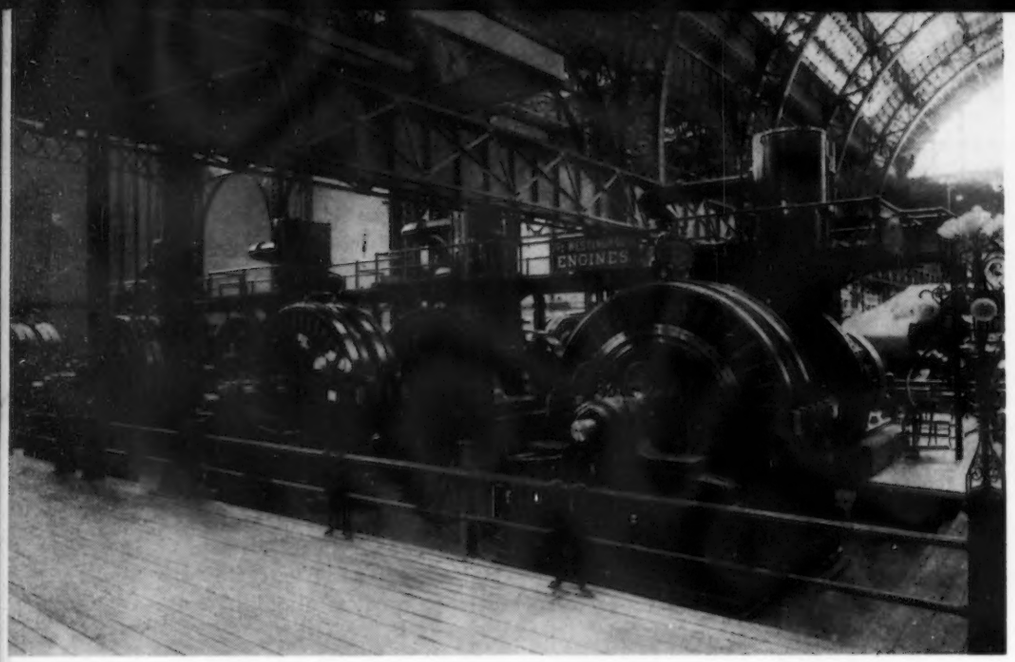
INVESTMENT of private funds in business enterprise is the key to the capital goods industries for 1936, John W. O'Leary, president of the Machinery and Allied Products Institute, declared in taking stock of the new year outlook for the 1000 capital goods manufacturers which comprise the institute.

"Business, as distinguished from individual consumers, buys more than 70 per cent of all the finished products of the capital goods industries," he said. "The largest item in machinery. Government activities reviving consumer purchasing power have only a slight beneficial effect upon the capital goods industries which depend upon business purchasing power.

"New security issues, which usually represent capital structure expansion or improvement, in 1935 totaled only about 375 million dollars. This is just a little more than one-tenth the yearly average of 3.5 billions during the decade from 1920 to 1930. The condition is not due to a shortage of money or credit; banks are bulging with the largest volume of idle funds any nation has ever had. The need is for risk-bearing capital—investors who have confidence enough in the future to put money in business enterprises. However, investments of this type have increased, especially during the latter half of 1935, following the significant Supreme Court decision which gave business new prospects of normal recovery, and the outlook for 1936 is encouraging."

Mr. O'Leary pointed out that some of the most spectacular gains in industrial recovery during 1935 were among the manufacturers of machine tools, but even this industry whose production is among the highest of all capital goods industries is at less than 60 per cent of the 1929 level as compared to near normal for most consumer goods industries.

First prize for the most distinctive booth design and product display at the 1935 exposition of the Chicago Purchasing Agents Association, Nov. 20 and 21, was awarded to Bliss & Laughlin, Inc., Chicago, an exhibit of cold-finished steel and shafting. The progressive development of the bars was shown in the various stages from the hot-rolled stock to the cold-drawn and ground shafts, and the turned and polished shafts. An exhibit of finished machine parts illustrated the application of B & L Ultra-Cut steel and Bessemer screw stock in the manufacture of hundreds of formed and threaded parts, used in assemblies of machinery and equipment.



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HERE is a picture of the complete polyphase system displayed by Westinghouse at the Chicago World's fair in 1893. Nearly every element of present day power systems was shown at this fair.

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40,000 Westinghouse Workers Join In C

IT is almost impossible for us moderns to conceive of daily life without the conveniences made possible by electricity. Even more impossible is it for us who are engaged in industry — and the metal-working industry in particular — to imagine what would confront us had not industrial electrification become an indispensable servant of production.

So accepted are the conveniences and necessities of electricity that it is amazing to reflect that this week, on Jan. 8, applied electricity, as made possible by the pioneer George Westinghouse and his contemporaries, is but 50 years old.

To commemorate this occasion in a unique and fitting way, the 40,000 employees of the Westinghouse Electric & Mfg. Co., at home and abroad, were joined together this Wednesday by radio, perhaps the latest or newest of the many marvels that they themselves had been so instrumental in creating.

At Pittsburgh, the meeting was addressed by Chairman A. W. Robertson, President F. A. Merrick and other national figures from outside the company. These

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THE first installation of motors for main roll drives in steel mills was made in 1905.

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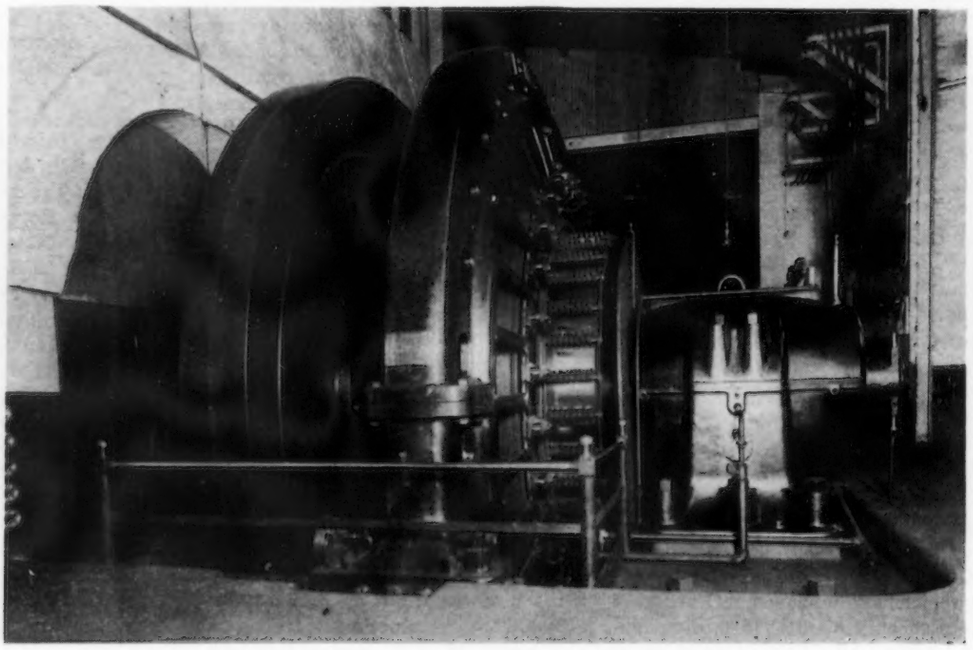

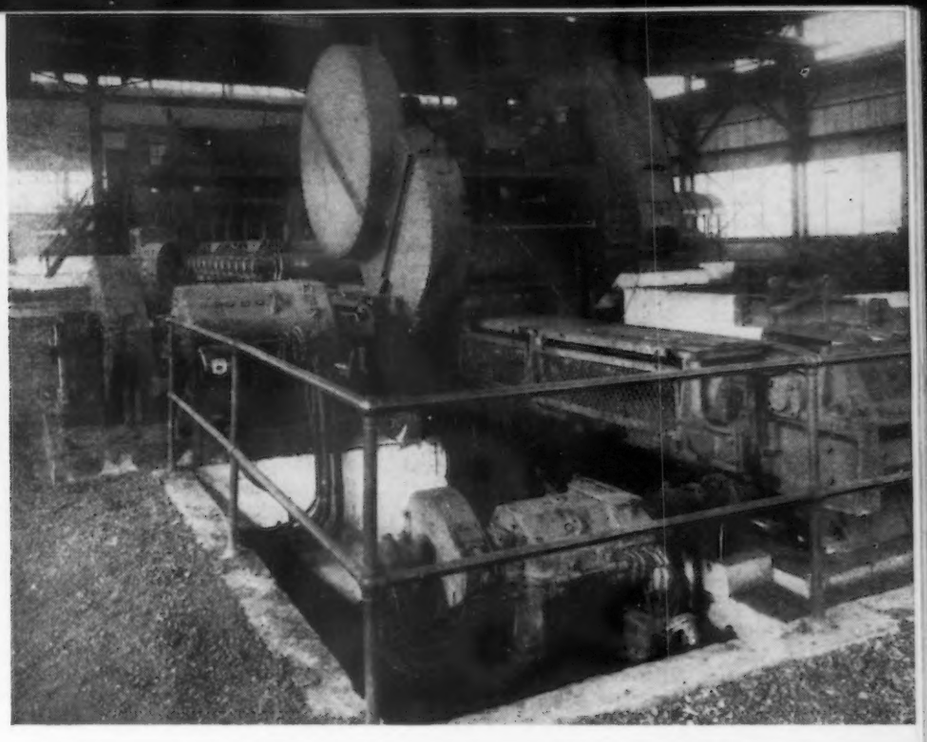

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BY the beginning of the present century, the advantages of electric drive for all auxiliaries for steel mills were well established.

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Company's 50th Anniversary Celebration

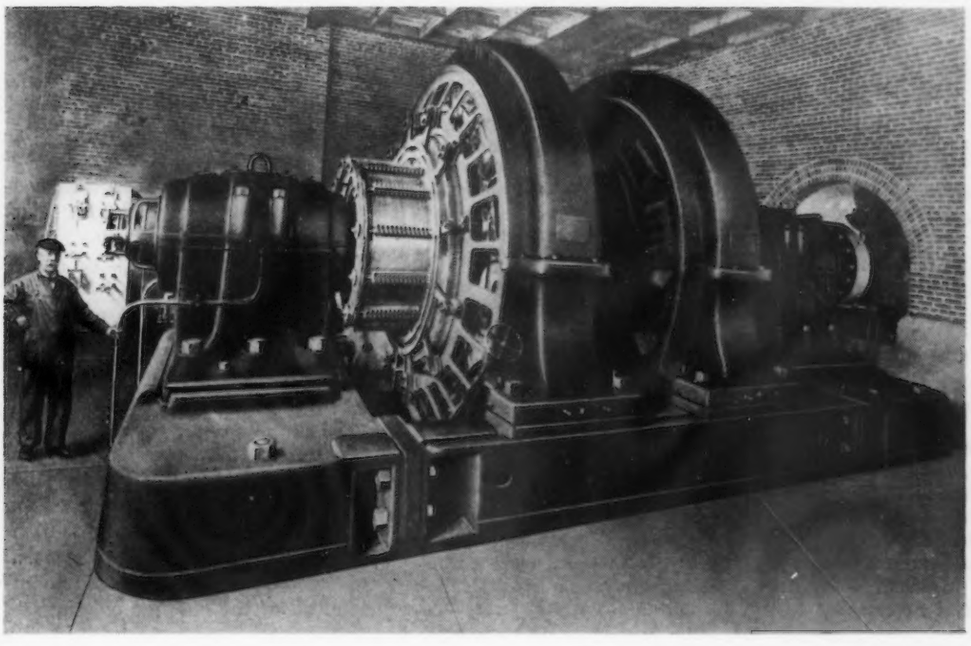
speakers reviewed the important contributions that Westinghouse has made to the progress of industry and presented a forecast of the future. Westinghouse's new institutional sound picture for its Golden Jubilee, called "The New Frontiers," was shown to employees for the first time on this occasion.

The Westinghouse company, incorporated Jan. 8, 1886, began operations the following March in a small factory building located in downtown Pittsburgh. Its first payroll contained the names of 200 employees.

Now, fifty years later, its various plants are nineteen in number; in normal years it employs more than 40,000 people; its annual sales amount to about $180,000,000, and it maintains sales organizations all over the world. The Westinghouse International Co. is represented in more than 80 countries.

First Catalog Offered 13 Items

The first catalog of the company listed 13 items for sale. Now its catalogs contain hundreds of thousands of items which include every



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AT the left is shown a picture of the first electric reversing mill drive.

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modern product for electrical service and other equipment used as accessories to electrical equipment. These adjuncts include steam turbine equipment, diesel engines, mechanical stokers, condensers, porcelain ware for insulators, gears, etc. Thus the company supplies everything required for electrical service from curling irons to electric locomotives or generating stations or radio broadcasting equipment.

Founded to develop electrical products in a day when electrical service was a hazy promise, the company immediately became the advocate of the alternating current system, and in that early day was the only important commercial proponent of this system now so universally established all over the world. Realizing the limitations of the direct current system, Westinghouse started the development of apparatus by which electrical energy could be generated, transformed for transmission to distant points, then reduced to pressures suitable for lighting and power purposes.

When bids were asked for lighting the World Columbian Exposition in Chicago, in 1893, Westinghouse proposed a new method, revolutionary at the time, and was awarded the contract. It involved the manufacture of 250,000 lamps and the installation of the alternating current machinery necessary to furnish power. A special unit, the "stopper" lamp, was developed for this installation, and success had been achieved when the illumination of the Exposition became a spectacle famous the world over.

The company also exhibited at the Exposition a complete polyphase alternating current system of power generation, distribution and motorization destined to influence the entire future of the electrical industry.

The company's Columbian exhibit also served as a method to introduce the induction motor, first offered for commercial use by Westinghouse in 1894. This type of motor expanded the use of alternating current beyond the field of lighting to include all power applications as well. Within 20 years electric motors had practically supplanted all other forms of power application.

Introduces American Turbine

In 1895 Westinghouse was awarded another important contract, this time to "harness" Niagara Falls. The generators built by the company to draw electric power from the tremendous force of water flowing over these huge falls were rated at 5000 hp.

In 1899 Westinghouse acquired a new steam turbine destined to revolutionize the existing method of generating electricity from coal. Using the turbine as a prime mover for electric generators at first, 400-kilowatt turbine-generators were built, next some 2000-kw., and so on, up to 20,000-kw. units. The success of these machines demonstrated that steam turbines would make possible the generation of power in almost unlimited ratings. Old methods again had been outmoded by the new, and new horizons in power development had become visible.

Radio Broadcasting

Radio broadcasting is, perhaps, the greatest development of the past 20 years, and the rapidity and completeness with which most nations have put it to use attest its world-wide usefulness.

Having started the service and the industry of broadcasting, Westinghouse continued its developments in this field and was responsible for early use of vacuum tube radio receivers, both battery and house circuit operated, improvements in station equipment that result in better quality, short waves, beam transmission and much other significant progress.

Lack of space in this issue prevents a more adequate presentation of the record of this company. Its lists of achievements is long. Some of them are as follows:

1888—built the first meter for measuring alternating current. 1891—introduced the first successful single reduction railway motor, establishing a type for subsequent practice. 1903—installed the first 50,000 volt transmission line. 1905—developed electric drive for the main rolls of a steel mill. 1906—electrified the New York, New Haven and Hartford Railroad. 1908—developed the mercury arc rectifier. 1909—installed the first 140,000-volt transmission line—electrified Italian State Railways. 1910—developed sectional drive for paper machines. 1915—electrified the Norfolk and Western Railroad for hauling coal up heavy mountain grades—electrified Pennsylvania Railroad from Philadelphia to Paoli. 1917—developed the automatic substation which assures adequate power for peak service required by railway systems. 1919—installed first 165,000-volt transmission line. 1920—developed Diesel-electric drive for ships—originated radio broadcasting by establishing KDKA. 1932—developed the de-ion system of arc control to increase capacities of circuit interrupting equipment. 1923—supplied locomotives and equipment for electrification of Chilean State Railway. 1924—developed metal alloys permitting the manufacture of smaller and more accurate measuring instruments. 1925—electrified the Virginian Railway, permitting this system to operate with 16 electric locomotives, whereas prior estimates had listed 64 steam locomotives and auxiliary switching equipment as being necessary. 1926—inaugurated the electric welding of buildings, thus revolutionizing many processes of building construction—developed the Grid Glow tube, or "electric eye," forerunner of the present-day industrial vacuum tube. 1929—built the first Diesel-electric locomotive in the United States. 1931—electrified the S. S. Coolidge, then the largest merchant ship built in America, with Westinghouse turbines, propulsion motors and auxiliaries—each of the two propulsion motors was rated at 13,250 hp. 1932—introduced the surge proof transformer, a great forward step in the war of engineers against the effects of lightning. 1933—built the world's fastest passenger elevators for use in Radio City building, Rockefeller Center, New York. 1934—built locomotives and other electrical equipment for electrification of Pennsylvania Railroad between New York and Philadelphia. 1935—built two of the largest waterwheel generators in the world, each rated at 82,500 kva., for Boulder Dam—equipped with Diesel-electric equipment the streamlined "Comet" for the New York, New Haven and Hartford Railroad—developed high intensity mercury lighting for industry and sodium lighting for highways.

On this unusual occasion, THE IRON AGE, as do the countless other friends of Westinghouse, wishes the company many happy returns of the day.

Scrap Chapters Prepare For Convention

SEVEN chapters of the Institute of Scrap Iron and Steel are holding a series of meetings to prepare their delegations for the annual convention of the institute, which will be held at the Sherman Hotel, Chicago, Jan. 21 to 23.

Meetings scheduled for this week include one held at Cleveland, Jan. 6; one at Detroit, Jan. 7; one at Cincinnati, Jan. 8, and one at St. Louis.

The New York chapter will meet on Tuesday evening, Jan. 14; the Philadelphia chapter will convene on Wednesday evening, Jan. 15; the New Jersey chapter on Thursday evening, Jan. 16. Benjamin Schwartz, director general of the institute, is expected to attend all of the chapter meetings.

Iron and Steel Exports and Imports Decline

IRON and steel exports from the United States in November, at 205,242 gross tons, represented the smallest total for any month to date in 1935 and a decline of 13.9 per cent from October.

Exports of scrap declined to 104,961 gross tons from 145,850 tons in October.

Iron and steel imports, at 56,637 tons, were 4.4 per cent below the October level but were 60 per cent ahead of the comparable month in 1934. Increases were registered in scrap, ferromanganese, spiegeleisen and wire rods. Though pig iron imports declined as compared with October, they represented the leading item on a tonnage basis. Of 15,550 tons imported in November, the Netherlands supplied 9782 tons, and British India, 3845 tons.

Exports (In Gross Tons)

	November		Eleven Months Ended November	
	1935	1934	1935	1934
Pig iron	352	230	3,041	3,120
Ferromanganese and spiegeleisen	42	59	131	144
Iron and steel scrap	104,961	216,566	1,902,429	1,639,193
Tin plate scrap	3,165	....	35,924	....
Waste-waste tin plate	2,420	....	21,081	....
Pig iron, ferroalloys and scrap	*110,940*	*216,855*	*1,962,606*	*1,642,457*
Ingots, blooms, etc	2,246	3,627	39,050	17,907
Skelp, iron or steel	15,642	11,058	61,131	74,073
Wire rods	1,796	3,710	23,147	23,274
Semi-finished steel	*19,684*	*18,395*	*123,328*	*115,254*
Bars, steel	3,798	3,502	48,811	37,426
Bars, alloy steel	425	253	2,642	2,663
Bars, iron	129	144	1,050	970
Plates, iron and steel	4,573	3,309	40,188	34,330
Steel sheets, galvanized	5,855	6,778	65,272	61,489
Iron sheets, galvanized	162	21	1,794	1,215
Steel sheets, black	9,592	10,377	92,812	81,524
Iron sheets, black	412	263	5,092	4,106
Hoops, bands, strip steel	4,270	2,027	41,254	25,756
Tin plate and taggers' tin	13,330	11,831	113,259	167,052
Tern plate (including long ternes)	149	....	2,132	....
Structural shapes, not fabricated	4,089	2,462	32,577	30,594
Structural shapes, fabricated	1,031	1,735	18,793	19,140
Tanks, except lined, etc	1,584	925	6,679	6,859
Steel rails	4,999	2,947	44,551	61,057
Switches, frogs, and crossings	865	929	8,939	5,530
Boiler tubes	505	885	8,112	7,542
Casing and oil line pipe	814	1,711	24,588	55,870
Pipe, black and galvanized, welded steel	2,067	2,997	30,387	40,695
Pipe, black and galvanized, welded iron	221	164	2,975	2,102
Plain wire	3,383	2,034	35,886	33,699
Barbed wire and woven wire fencing	2,993	2,570	30,732	34,686
Wire cloth and screening	60	64	938	899
Wire rope	480	212	3,780	2,533
Wire nails	1,100	1,044	10,081	12,184
Other nails and tacks	292	324	3,411	4,605
Other wire and manufactures	508	337	4,820	4,362
Bolts, nuts, rivets and washers, except track	503	434	5,889	4,558
Other finished steel	135	122	1,357	1,626
Rolled and finished steel	*68,324*	*60,401*	*688,831*	*755,072*
Cast iron pipe and fittings	1,911	1,366	17,001	15,558
Malleable iron screwed fittings	227	207	3,191	2,751
Carwheels and axles	2,156	1,195	16,270	6,171
Iron castings	966	400	8,486	6,462
Steel castings	251	181	2,550	2,175
Forgings	783	262	5,804	3,860
Castings and forgings	*6,294*	*3,611*	*53,302*	*36,977*
Total	205,242	299,262	2,828,067	2,549,760

Imports (In Gross Tons)

	November		Eleven Months Ended November	
	1935	1934	1935	1934
Pig iron	15,550	6,055	114,648	111,828
Sponge iron	195	....	1,284	796
Ferromanganese and spiegeleisen [1]	8,153	10,826	49,821	36,427
Ferrochrome [2]	10	....	11	74
Ferrosilicon [3]	78	45	772	719
Other ferroalloys [4]	....	....	1	46
Scrap	15,392	7,606	53,763	39,932
Pig iron, ferroalloys and scrap	*39,378*	*24,532*	*220,300*	*189,822*
Steel ingots, blooms, etc	83	408	2,045	1,825
Wire rods	2,612	880	15,494	9,693
Semi-finished steel	*2,695*	*1,288*	*17,539*	*11,518*
Concrete reinforcement bars	166	101	2,746	1,239
Hollow bar and drill steel	88	43	1,089	719
Merchant steel bars	....	1,696	8,439	17,411
Bars, whether solid or hollow [6]	2,147	....	13,725	....
Iron slabs	....	....	....	1
Iron bars	86	15	1,470	714
Boiler and other plate	54	11	541	246
Sheets, skelp and saw plate	541	219	10,002	4,217
Tin plate	8	2	182	98
Structural shapes	3,828	3,328	35,983	22,251
Sheet piling	....	....	225	1,109
Rails and rail fastenings	762	305	4,955	3,025
Welded pipe	396	97	4,253	1,666
Other pipe	431	235	14,110	2,798
Cotton ties [5]	....	....	8,136	....
Other hoops and bands	1,597	1,840	20,306	16,877
Barbed wire	1,486	294	22,720	8,528
Round iron and steel wire	253	209	3,587	2,366
Telegraph and telephone wire	15	1	38	44
Flat wire and strip steel	204	216	1,696	1,625
Wire rope and strand	281	60	1,863	1,433
Other wire	120	64	1,215	748
Nails, tacks, and staples	1,883	486	19,205	6,581
Bolts, nuts, and rivets	35	29	274	242
Horse and mule shoes	43	59	552	379
Rolled and finished steel	*14,394*	*9,310*	*177,312*	*94,317*
Malleable iron pipe fittings	....	....	46	....
Cast-iron pipe and fittings	46	25	76	65
Castings and forgings	124	115	1,188	1,360
Total	56,637	35,270	416,461	297,032

[1] Manganese content. [2] Chrome content. [3] Silicon content. [4] Alloy content [5] New class. No comparable figures for 1934 or previous years. [6] New classification as result of the Reciprocal Trade Agreement with Belgium. No comparable figures for previous year.

Sources of American Imports of Iron and Manganese Ores

(In Gross Tons)

	November			
	Iron Ore		Manganese Concentrates, 35 Per Cent or Over	
	1935	1934	1935	1934
Canada	60	....	....	....
Cuba	....	22,000	....	2,596
Chile	108,725	43,400	....	....
Spain	413	100	....	....
Norway	8,864	....	....	....
Sweden	14,911	7,383	....	....
French Africa	5,700	....	....	....
Russia	8,050	5,440	1,833	4,570
India	....	....	4,975	....
Brazil	....	....	1,804	4,057
West Africa	....	....	6,092	2,345
Other countries	11,121	751	65	101
Total	157,844	79,074	14,769	13,669

United States Imports of Pig Iron by Countries of Origin

(In Gross Tons)

	November		Eleven Months Ended November	
	1935	1934	1935	1934
United Kingdom	100	60	13,825	600
British India	3,845	2,201	31,458	32,705
Germany	156	....	3,427	....
Netherlands	9,782	2,539	41,097	61,939
Canada	1,188	740	13,077	8,700
France	....	....	50	100
Belgium	....	....	100	50
Norway	169	139	2,395	2,185
Sweden	260	376	907	991
Russia	....	....	7,408	....
All others	50	....	904	4,558
Total	15,550	6,055	114,648	111,828

▲ ▲ ▲ Capital Goods Index

HEAVY industrial activity, subject to the many interruptions of the past two weeks, has fallen off, as measured by THE IRON AGE Capital Goods Activity Index, and for the seven-day period ended Jan. 4 the index stood, it is estimated, at 71.6. This compares with a revised figure of 78.1 for the week before, and with a figure of 62.4 for the first week in 1935.

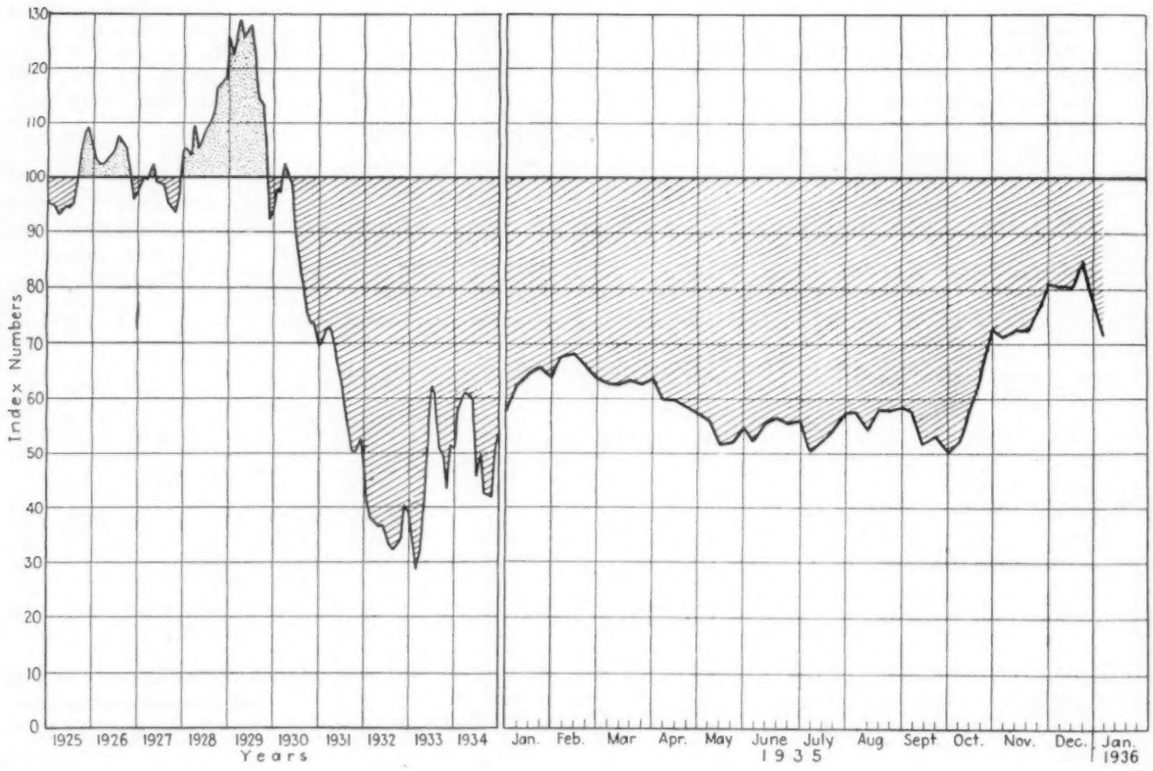
Plant shutdowns in the automotive field, reduced steel mill operations, drastically lowered freight car loadings of forest products and other factors in general made for the let-down. The construction volume index alone registered a gain.

To a certain extent outmoded seasonal adjustment factors, which have not yet been revised on the basis of latter-day experience, are improperly affecting index readings. Accordingly, the index numbers published herein should be considered temporary. The trend of business during the past two weeks is correctly described, but the values given are perhaps not exact. The availability of new

The Iron Age Weekly Index Numbers of Capital Goods Activity

(1925-'27 = 100)

Last week (est.)	71.6
Preceding week (rev.)	78.1
Same week last month	80.4
Same week 1935	62.4
Same week 1934	50.3
Same week 1933	39.6
Same week 1932	52.3
Same week 1931	64.7
Same week 1930	89.6
Same week 1929	118.7



(1925-27 Average = 100)

The Iron Age Index of Capital Goods Activity. The years 1925 to 1934 are plotted by months, the current year by weeks.

Components of the index: Steel ingot production rate, from THE IRON AGE; revenue freight carloadings of forest products, from Association of American Railroads; automobile production from Cram's Automotive Reports; heavy construction contract awards, from *Engineering News Record;* index of productive activity in Pittsburgh district, from Bureau of Business Research of University of Pittsburgh.

Declines Sharply ▲ ▲ ▲

seasonal correctives will make it possible to publish a revised list of index numbers shortly.

New Housing Needs Responsible for Construction Gains

The marked improvement in residential construction work undertaken during 1935, as compared with 1934, has appreciably helped the capital goods industries to regain some measure of stability, but at the same time losses suffered by other classes of construction have slowed down the growth in this respect. The accompanying chart, which is based on reports of the F. W. Dodge Corpn., shows proportionally how different classes of construction benefited during nine months last year.

Out of total awards for this period of $1,191,700,000, residential projects claimed $338,800,000 or 28.4 per cent of the total. Public works and public utility enterprises took $429,000,000 or 36 per cent. Although the latter class considerably exceeded the former, it experienced a 36 per cent loss compared with 1934, while residential awards actually rose 188 per cent.

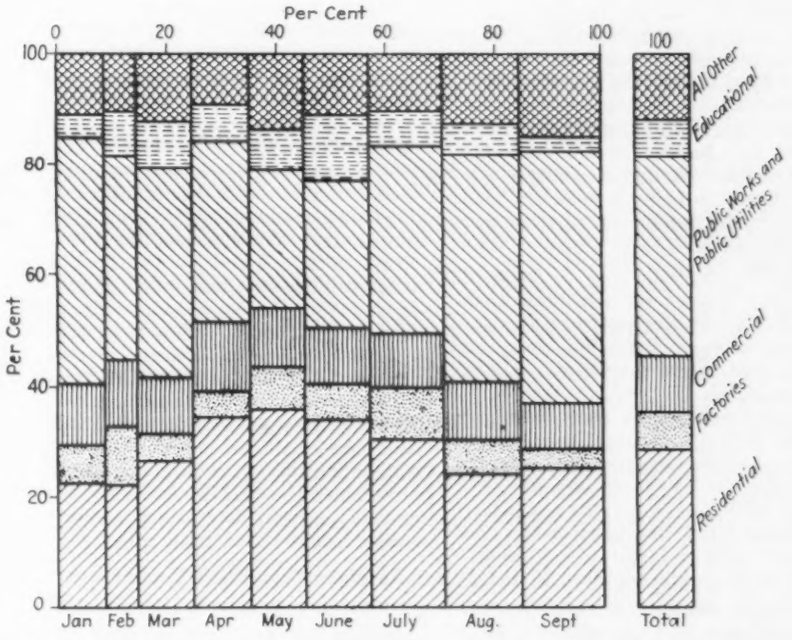
For all types of construction during comparable nine-month periods, 1935 showed a 1 per cent loss. By the following month, however, this had been translated into a 4 per cent gain as compared with 10 months of 1934. Addition of December's figure, not yet obtainable, should reveal a still greater percentage rise, as in the final quarter of 1935 business tended to quicken its stride.

The substantial progress made during 1935 in the residential field reflects the urgency of new housing needs directly, while the downward deflection in contracts placed among public utility interests resulted from the hampering effects of administrative legislation. Disclosure of figures covering this type of construction in the last three months of 1935, when available, should show more substantial indications of progress.

Referring once more to the chart, third in importance with respect to building activity, omitting the "all other" designation, was commercial construction, with 10.3 per cent of the total. Factories claimed 6.6 per cent, educational institutions 6.5 per cent, and all other uses, 12.2 per cent.

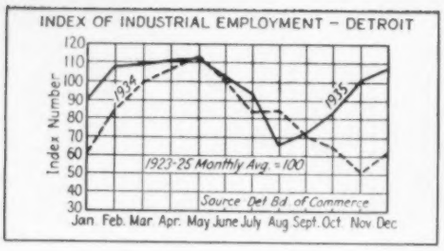
The relative importance of each of these classifications by individual months can be quite accurately gaged by determining the areas of the divisions indicated. Horizontally the chart reveals the distribution of awards by months, while vertically it shows allotments by construction classes. Nine-month totals, of course, are shown independently. Moreover, since percentages are involved, only relationships can be read.

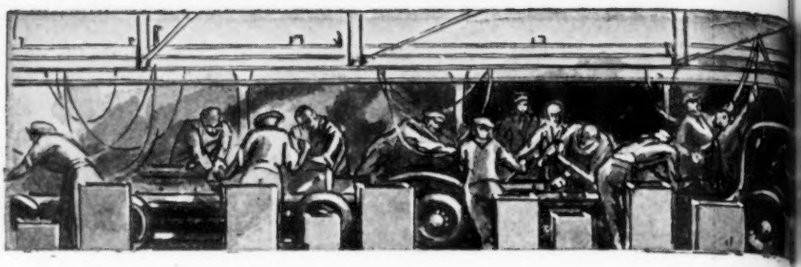
Reading across the chart, it is seen that of the total nine-month awards of $1,191,700,000 February claimed the least amount, with but 6.3 per cent. Thereafter, a steadily rising trend is indicated, culminating in August when 14.2 per cent of total expenditures was allotted. September, with 14 per cent, was hardly less important. Subsequent months are not shown, but total awards of all types in October reached $200,863,700, indicating a 20 per cent gain over September. In November this figure declined, but still was 12 per cent above September.



Construction Contracts Awarded, By Types of Construction; On Percentage Basis, Nine Months, 1935.

Source: F. W. Dodge Corpn., 37 Eastern States: Federal Reserve Bulletin.





THIS WEEK ON THE

Car Builders Swing Into Stride After Holiday Lull

DETROIT, Jan. 7.

STEEL releases immediately following the holidays would indicate that the motor car builders will readily maintain the pace of the past few months. The pressing problem of disposing of used car stocks is being met in fighting fashion on several fronts, so that this ominous cloud on 1936's horizon may perhaps evaporate into the blue by the time the flowers begin to bloom in the spring. Near-zero temperatures have been no inducement for buyers to frequent the second-hand car lots in Detroit, but the "heat" is being turned on, both locally and nationally, to thaw out the reluctant buyer ahead of the seasonal trend.

Ford dealers of Michigan took page "ads" in the local press to announce a money-back guaranty on used cars priced over $100. "Drive it two days. If you're not entirely satisfied — bring it back and *get your money.*" Looks like a smart idea, because anyone is likely to feel that if any "bugs" are present, they will show up after a short period behind the wheel when the anxious dealer is not sitting alongside to mitigate one's worst fears.

Bigger national news is the announcement by Chevrolet of a million dollar fund to alleviate the used car market by the stimulation of used car sales and the junking of obsolete and antiquated ones. Since Chevrolet dealers will accept other makes in trade, the plan will help other manufacturers as well. In this connection, in a recent talk before the Detroit Engineering Society, William S. Knudsen, executive vice-president of General Motors Corpn., expressed the thought that the industry should let demand for new cars be governed by the wearing out of the old, that production should be geared to replacement.

New Ford Financing Plan

Practically simultaneously with Chevrolet's announcement came word of a new "$25-a-month" plan for financing retail purchases of *new* Ford cars. The plan is offered Ford dealers through Universal Credit Co. Finance charges are at the rate of ½ per cent per month on the unpaid balance, plus insurance costs at regular conference rates. By thus opening up a practically new reservoir of credit, it is expected that new markets will be found in the wage earner class. Monthly payments of less than $25 may be arranged, if a larger down payment is made, so that the possibility of a new car is within the reach of those with limited budgets. In a way, this move will hinder rather than help the used car situation, since the plan is obviously intended to cater to those who normally would buy a used car.

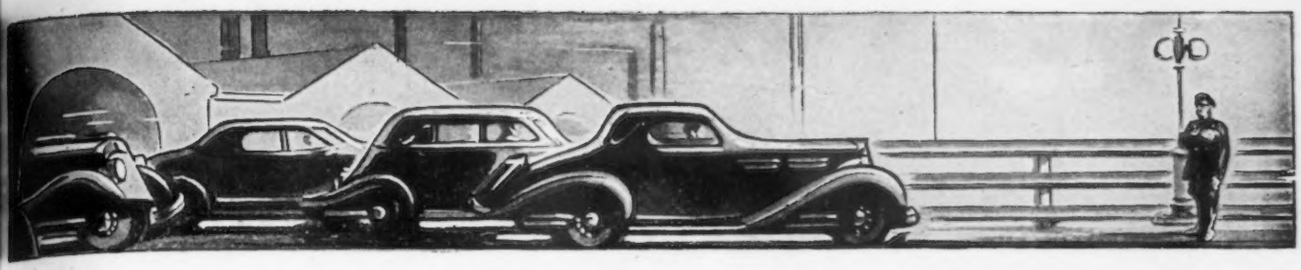
Accident Prevention Undertaken

Next to used cars, a big industry problem and one that is receiving increasing attention is that of automobile accident prevention. Buick fired the first 1936 gun in this fight by announcing the Buick Safety Legion, to be launched on Jan. 15 with an expected membership of 200,000 drivers. Purposes of the Legion are the promotion of safe and courteous driving among Buick owners, and the acceptance by them of leadership in their local communities in a movement to reduce accidents on the highways. Members will be pledged to thoughtful driving and will display a membership badge on their license plates. It reminds one of the old days when passing motorists would salute with a toot of the horn a driver of a like make of car. The courtesy of the road was a sort of *noblesse oblige* in those concreteless times. Perhaps, Buick, through its 2,500,000 owners, can bring back such courtesy.

After one of the most successful years in its history, Packard Motor Car Co. declared a 10c. dividend on each share of its stock, the first disbursement since 1931, when a total of 45c. per share was paid. Proposals for new machinery for a low-price six have been on the boards since last August, although no inkling of plans for a line lower in price than the "120" leaked out until very recently. It was rather expected that closures on these bids would take place before the year-end, but nothing definite has transpired to date. In the meantime, Packard shut down for a week for inventory, reopening on Jan. 6.

Ford's partial shutdown between Christmas and New Year's made itself felt throughout the city. Both Briggs Mfg. Co. and Murray Corpn. curtailed schedules to conform, and other Ford suppliers did likewise.

Pontiac production in Pontiac is assuming more important proportions daily. The foundry went into operation on Dec. 16 with a skeleton crew of 150 men, later to be built up to 800. Releases on new machinery for producing rear axles reached machinery suppliers last



ASSEMBLY LINE

By FRANK J. OLIVER
Detroit Editor, The Iron Age

week, and before long Chevrolet's gear and axle plant in Detroit will cease to supply these components.

Machinery purchases by Ford Motor during past weeks have largely been for the valve plant at Northville, Mich. Replacement of machinery at the Rouge plant is almost a continuous process. Chrysler's purchases of new machinery during the past year have been disappointingly low, and it is hoped that recent increases in earnings and in reserves will permit a more liberal spending policy. The corporation recently set aside considerable money to equip an apprentice school, but apparently it is to be furnished with surplus machinery from other departments, particularly the tool room.

Chrysler, by the way, is one of the many companies climbing up on the apprenticeship bandwagon. Having done nothing about the training of skilled workers throughout the depression, except to absorb a fraction of the trade school graduates that Ford Motor Co. was not able itself to employ, Detroit suddenly awoke to the fact that an acute shortage was not far off. Personnel people began to see the writing on the wall almost a year ago. They organized a manufacturers' committee for apprenticeship training in February, and by late October were in a position to corral the top executives in the industry and win their endorsement of a city-wide campaign. A trade school superintendent, loaned by the Board of Education, has been named director for a year. Backed up by several employer groups, during the first month in office, he was able to place almost 500 technical high school graduates in local shops on a training basis. Chrysler's program calls for full-time instructors, with the school segregated from the rest of the shop. Other plants, especially the smaller ones, will use apprentices in their regular tool rooms and in maintenance crews and will avail themselves of public school facilities for classroom work.

Anticipating Need of Trained Mechanics

Quite spontaneously, another group in Detroit had visualized the need for trained mechanics. Machinery dealers were beginning to get the reaction that sales of machine tools might ultimately hinge upon the discovery or the development of men to run them. While the general impression is abroad that modern equipment needs only a button-pusher to operate it, a study of almost any modern production unit will reveal a complication of design fit to baffle all but the born mechanical genius. The dealers as a group were seriously considering taking steps on their own part, at least to stimulate interest in the training of young men for mechanical careers, until they discovered what was already afoot.

Increased traffic from the automobile companies is an important factor in freight car orders expected this year. Railroads have been meeting competition from driveaways and trailer trucks by adopting car-loading devices to increase the number of automobiles per freight car, hooking one end up to the ceiling and the like. A large percentage of existing cars has already been so equipped, and what increased business the railroads may expect will come from new cars to which these devices will be adapted. A goodly portion of Pennsylvania's 10,000-car order will be for such rolling stock.

Employees Thank General Motors

"In behalf of the employees of the Chevrolet Gear and Axle Plants, we, the Chevrolet Works Council, wish to extend at this time our most thoughtful thanks and appreciation for the humane and generous treatment bestowed upon us by the guiding spirit of the General Motors Corpn." So began an advertisement in a local newspaper a few days ago. Yes, thanks a million, thus proving beyond doubt the value of Christmas bonus in building up plant morale and industrial good will! In fact, it is understood that several other important manufacturers were considerably embarrassed by this well-guarded move on G.M.'s part.

Detroit's only strike at the Motor Products Corpn. plant seems to have about petered out, owing largely to internal dissension among the three groups which sought to represent the workers. From this tactical blunder, the labor groups have learned a lesson, and a few days ago the officials of the United Auto Workers (A. F. of L. affiliate), the Automotive Industrial Workers Association and the Mechanics Educational Society smoked the pipe of peace around the council table. The inference is that there will be plenty of united action "the next time."

New G.M. Stamping Division

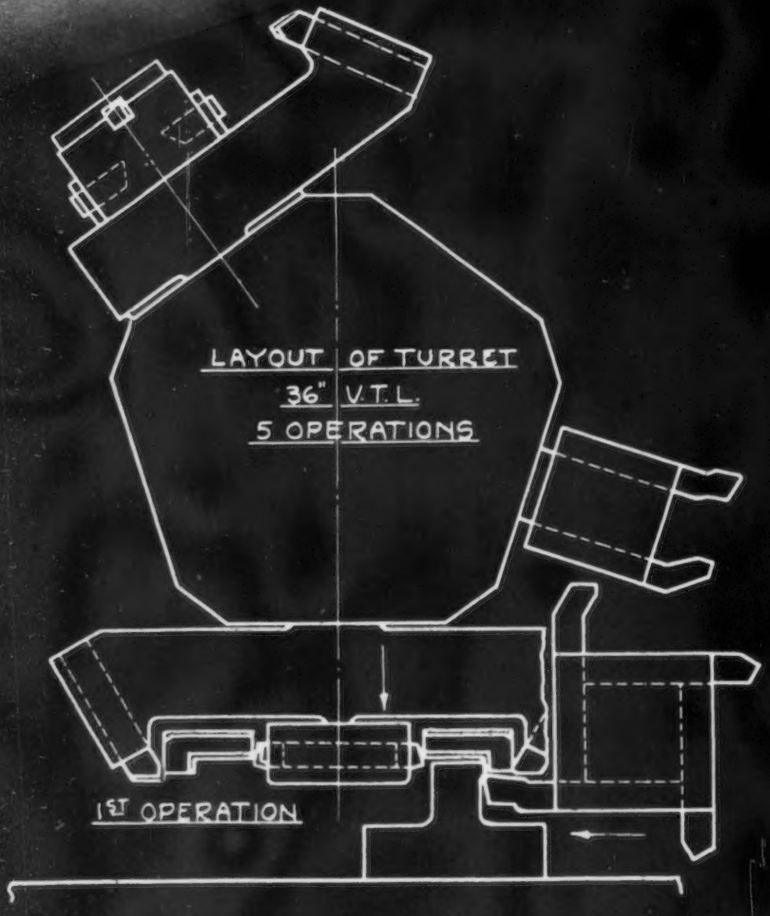
Bids are already being received from contractors for the construction of General Motors' stamping division plant at Grand Rapids, Mich.; contracts should be let by Jan. 10. Details are now available on the structure, which will have as window area 82 per cent of the wall space. Receiving rooms for both the die and the press shops will occupy a single craneway, 100 ft. in width and running the full length of the building, 525 ft. At right angles to this room will be seven craneways, 75 ft. wide and 260 ft. long, two of them serving the die shop at the front, and the other five the press room. Double rows of presses are scheduled for installation in each craneway, making 10 production lines, each of which will handle a complete stamping from sheet to finished form. Fifty- and 30-ton cranes will serve the presses and handle the dies.

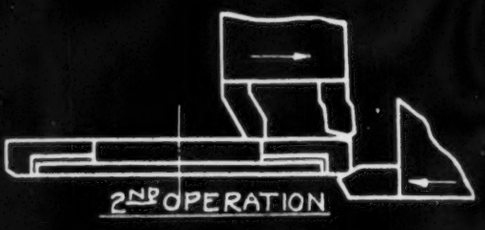
Because water underlies the site, a huge pit is being constructed beneath the press room to prevent water infiltration. The pit is made like a concrete boat, and is massive

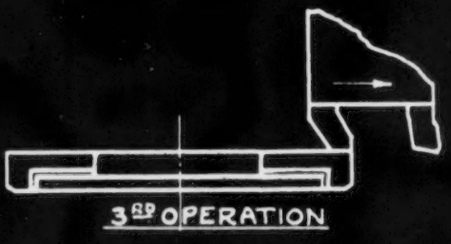
TIME SAVED
is
MONEY EARNED

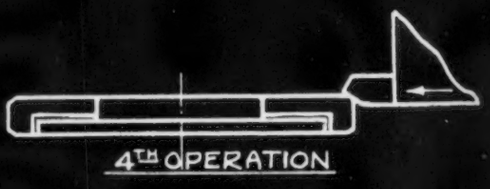
Best Previous Time on this Alloy Bronze Casting - Feed Worm Wheel - was 12.01 min. Bullard High-Speed Vertical Turret Lathe Time with Group Tooling is 3 minutes, 41 seconds. This shows a saving of 8 minutes, 19.6 seconds per piece machining time.

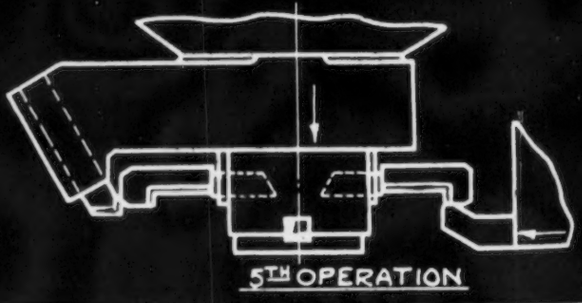
Operations as follows: Rough Bore, Turn and Face, Champfer - Finish Face - True Bore, Finish Turn and Ream.











BRONZE WORM GEAR MACHINED ON HIGH SPEED VERTICAL TURRET LAT

THE BULLARD COMPANY BRIDGEPORT CONN.

enough to absorb the shock of the presses above.

Adjoining the press room is the metal shop, 375 ft. long and the full width of the plant, where necessary welding operations will be performed, and finished parts stored. A separate structure will house the power plant, which will be equipped with three 4500-hp. boilers. Equipment will also include a turbo-generator and three air compressors of 10,000 cu. ft. per min. capacity.

In the meantime in Detroit, bids have been opened on a new die shop for the Briggs Mfg. Co. to be erected on Dix Avenue on the west side of town. Industrial construction in this area began to pick up in the latter part of 1935. Movement has been from the more congested downtown industrial sections. American Blower Co. will move into its new plant on Joy Road in early spring. American Twist Drill Co. is putting up a new and larger structure, and Continental Die Casting Co. goes to larger quarters near the airport.

Ford Installing More Glass Capacity

Completing its glass plant program begun last March, the Ford Motor Co. has called for bids on the construction of its second continuous glass melting furnace at a cost of approximately $500,000. Capacity will be raised from 75,000 to 200,000 sq. ft. of rough plate glass daily. For several months, installation of a glass grinding and polishing line has been going on, and a large stock of rough rolled glass has been built up from the output of the existing furnace. The second furnace, which will be completed in about five months, will coordinate production of rough plate to finished safety glass. The grinding line should be in operation by the end of February. When production starts, about 900 men will be added to the present payroll of 1100 men in the glass factory.

Milling machines, grinders, automatic gear cutting and hobbing machines, screw machines, micrometer calipers and other machinist's tools, cutters and hobs, screw machine tools, and a wide variety of miscellaneous equipment are described and illustrated in the new 572-page, 4⅝ x 6¾-in. catalog, the No. 140, being issued by the Brown & Sharpe Mfg. Co., Providence, R. I. The catalog includes all the new machines, tools, attachments and accessories brought out by the company during the past year, and, as heretofore, it includes a wealth of useful data.

British Pig Iron Shortage Is Threatened — Steel Makers Busy

LONDON, Jan. 6 (*By Cable*).— Pig iron is firm and an early price advance is expected. Scarcity of supplies is accentuated by scrap shortage. Given a peaceful settlement of the coal dispute, several furnaces will be relit in the coming weeks.

Steel makers are again working at full pressure and holiday accumulations are rapidly disappearing. Output will be enlarged when pig iron is more plentiful. Meanwhile production, especially of semi-finished steel, is insufficient and makers are cautious regarding new business. Specifications for rails, structural steel and shipbuilding steel are increasing. Bridge builders anticipate a busy year. The tin plate home market still is quiet after the holidays, and exports are virtually lacking, owing to withdrawal of permits.

The Continental iron and steel market is comparatively satisfactory for this time of year and business revival is expected after Jan. 15. The Continental Steel Cartel and British interests are meeting today to discuss creation of an International Thin-Sheet Cartel.

Difficulties are being encountered in the International Wire Rod Cartel owing to quota demands of the Belgian Clabecq and Providence works, which are increasing production, and the German group's threatened withdrawal. The cartel, which now controls home and export markets, may be transformed into purely an export organization.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9		
Billets, open-hearth	£5 10s.	to	£5 15s.
Tin plate, per base box	18s.	9d. to	19s. 3½d.
Steel bars, open-hearth	£7 17½s.		
Beams, open-hearth	£7 7½s.		
Channels, open-hearth	£7 12½s.		
Angles, open-hearth	£7 7½s.		
Black sheets, No. 24 gage	£9 15s.		
Galvanized sheets, No. 24 gage	£11 15s.		

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.

Billets, Thomas	£2 7s.		
Wire rods, No. 5 B.W.G.	£4 10s.		
Steel bars, merchant	£3 5s.		
Sheet bars	£2 8s.		
Plate, ¼ in. and up	£4 2s.	6d.	
Plate, 3/16 in. and 5 mm.	£4 4s.	8d.	
Sheets, ⅛ in.	£4 9s.	8d.	
Beams, Thomas	£3 2s.	6d.	
Angles (Basic)	£3 2s.	6d.	
Hoops and strip base	£4 2s.	6d.	
Wire, plain, No. 8	£5 7s.	6d.	
Wire nails	£5 15s.		
Wire, barbed, 4 pt. No. 10 B.W.G.	£8 15s.		

Mesabi Iron Ore Shipments High

IRON ore shipped from the Mesabi Range in 1935 comprised 66.58 per cent of the total movement as compared with 67.07 per cent in 1934 and 62.3 per cent in 1933, according to the annual report covering water shipments prepared by the Lake Superior Iron Ore Association. The relative position of the various ranges in the amount shipped did not change during the year.

The percentage of non-Bessemer ore shipped gained slightly, being 71.48 per cent of the total as compared with 70.74 per cent during 1934 and with 68.8 per cent in 1933. Out of total shipment of 28,078,782 tons, the non-Bessemer grade accounted for 20,071,373 tons. Bessemer ore declined slightly in the percentage shipped to 23.19 per cent as compared with 23.28 per cent during the previous year, and with 26.4 per cent in 1933. The movement of manganiferous ore increased to 983,927 tons from 695,096 tons during the previous year. Shipments of silicious ore declined slightly.

TOTAL 1935 MOVEMENT OF ORE BY GRADES

	Tons
Bessemer	6,511,805
Non-Bessemer	20,071,373
Manganiferous	983,927
Silicious	511,677

MOVEMENT BY RANGES

Mesabi	18,695,407
Marquette	3,111,376
Gogebic	3,038,101
Menominee	1,628,029
Vermilion	842,780
Cuyuna	763,089
Total	28,078,782

THIS WEEK IN WASHINGTON

President's message to Congress opens 1936 campaign.

° ° °

Control by White House promises to head off worst of proposed legislation.

° ° °

Bill to tax labor-displacing machinery heads list of suggested foolish bills.

° ° °

Controller General puts crimp in Guffey bill by ruling that "provisions" are not affected.

° ° °

Supreme Court voids AAA in its entirety.

° ° °

By L. W. MOFFETT

Resident Washington Editor, The Iron Age

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WASHINGTON, Jan. 7. — The final session of the 74th Congress is under full steam. . . . Opened at noon last Friday with the usual blare, political fury and frivolity, which was broadcast to the country, the President, once again shattering precedent, went before it that night and delivered his message, supposedly on the "state of the union," with a world-wide radio hook-up carrying his voice over much of the globe. . . . He thus got the largest audience that ever heard a Presidential voice. . . . On Monday he sent the budget message to Congress. . . . While calling for a cut in huge expenditures, it carried the usual bad news for taxpayers, including business and industry. . . . For the inevitable payoff will come, soft phrases seeking to reassure to the contrary notwithstanding. . . .

Vigorous Republican criticism resulted from the President's appearing in person before Congress at night to deliver his message. . . . It was termed "cheap political showmanship" and worse. . . . The time was set when most of the nation's population is either at home or can otherwise conveniently slide before a radio to hear the "fireside" talk. . . . It was characterized as the President's opening campaign speech. . . . It was also stated that he had taken advantage of his high position to lay before invisible millions, with his exceptionally fine radio voice, reasons why the New Deal should be continued in power at the November election. . . .

Cheap or good political drama, it may be safely ventured that, partisanship aside, the country would vote for the President. . . . After all, even he has the right to make use of the marvels of the radio. . . . Regardless of political-timing, the fact remains that the message he delivered was an official message. . . . The entire country was or should have been interested in it. . . . And seeing that many won't read, but are prepared to hear because of the lesser mental strain, it is well that modern technological development is at hand. . . .

The fact also remains that the opposition is free to go on the air at 9 o'clock at night or at any other hour when it thinks it can reach the greatest audience. . . . To limit this facility is but another form of curbing freedom of speech. . . . And some critics of the President's night broadcast have themselves charged that the New Deal has endeavored to throttle public expression. . . . But for all its shortcomings this is a charge that has never truly registered against the New Deal. . . . For that matter, neither it nor its opposition could suppress freedom of speech even if it were attempted. . . . On the contrary, speech would be even more free and vociferous, if that is possible. . . .

As it is, one of the most blistering political campaigns the country has ever faced is on and a large amount of it will be marked by battles on the air. . . . Bizarre and dull, spectacular and drab, the most wholesome element in demands for time on the air is the evidence of widespread public interest in politics and government, economics and social problems and the many present-day perplexities. . . . It will give the public a chance to make its own analysis of discus-

sions, to separate the wheat from the chaff, to determine the descents to low political levels and the ascents to statesmanship. . . . And never before were the latter more necessary. . . . Seldom have they been so rare. . . .

Which directs attention to the broadcast of Congressional procedure. . . . It would be well if Congress was put on the air often, rather than simply during the opening and closing of sessions. . . . In that event Congress might have more serious moments, less political horseplay, a dimunition of kindergarten antics. . . . Some members, of course, would take advantage of the radio to intensify their ballyhoo for the benefits of their dear constituents back home, but with the entire country given an opportunity to listen in, the reaction would be inevitably beneficial.

Probably some allowance should be made for the temper of Congress at opening sessions, but even the greatest generosity in this direction cannot dismiss misgivings as to its calibre as indicated at its performance when the final session of the present Congress convened. . . . A little good-natured fun, such as was indulged in, came in well over the air, but it did not stop there. . . . It didn't stop at political caterwauling. . . . The House especially was shot through with levity; it acted like a lot of irresponsible children at a circus; and it engaged in a verbal dance of political madcaps, as though only one thing in the world mattered. . . . That was reelection next November. . . . State cares, which never required g r e a t e r consideration, seemed to be the farthest thing from the minds of most of the members. . . .

It is spectacles such as this that make the country, particularly business and industry, sneer at "Washington," using the term in a generic sense. . . . Yet it is the country that makes Washington, and if apology should be forthcoming it should come from the country, not from Washington. . . . So if the radio, together with the press and other sources reaching the public, can make the country more constructively and actively politically minded, this Washington at which the cavaliers now turn up their noses would be more representative of a sane and sensible republic than it now is. . . . And from the standpoint of economics, dollars and cents and recovery, its value could not be overstated. . . . It would stop wholesale crackpot legislation and fantastic expenditures that have mounted to such astronomical proportions as to have occasioned alarm. . . . As an immediate safety valve, the source of remedy lies in the Supreme Court rather than in the public. . . .

But, like preceding sessions, the present meeting of Congress will be an expensive one. . . . Estimates already have been made that it will heap upon the country an additional $5,000,000,000 or $6,000,000,000 of debt. . . . Talk of paring down expenditures and of moves toward balancing the budget carries but little weight in view of this prospect. . . . Additional emergency appropriations, including s o m e $500,000,000 for public works, large funds for needed additional national defense, and a soldiers' bonus of some $2,000,000,000 make up the principal items. . . . Assurances are given or attempted that inflation is not contemplated. . . . And, of course, the idea of repudiation is scorned. . . . With these out, it is clear that heavy additional taxes lie ahead. . . . Even though the Administration will skirt around taxation before election, it is inevitable that it is most definitely in the cards after election. . . . These tremendous expenditures obviously would hardly be pin money, however, if Congress went through with proposals of many of its political playboys, including those who, with tongue in cheek, are sponsoring the wild Townsend plan, praying it will get nowhere, except to pull votes from a gullible constituency. . . . And be it said for Congress, the prayer will be answered. . . . Even its insensate legislative mania won't gulp that economic paroxysm. . . .

The bonus, appropriation bills and neutrality legislation are the highlights as to prospective enactments. . . . Additionally, there are indications that organized labor might get through a modified Walsh bill to compel Federal Government contractors to adhere to old code wages and hours. . . . The Administration itself having urged the legislation, it is assumed that if passed it would meet with White House approval. . . . One of the modifications proposed is to relieve contractors of the responsibility of guaranteeing that subcontractors have adhered to code hours and wages. . . . The other removes the requirement that code wages and hours have been lived up to since the Schecter decision. . . . It is like the old bill of Representative Walter of Massachusetts and will be launched in the House by Representative Healey of Massachusetts. . . . The 30-hr. work bill again is being espoused by organized labor, and its authors, Senator Black of Alabama and Representative Connery of Massachusetts, have stated they will insist upon its passage. . . . Its passage by Congress would be no surprise. . . . Which would mean that it would be laid at the door of the White House. . . . Unless the White House in the meantime blocks passage. . . . The assumption is the Administration opposes the measure. . . . The O'Mahoney bill to license industry, also organized-labor sponsored, will be rehashed, but its passage is not expected. . . . The Administration has never gone on public record with regard to the bill, and it is doubted that it has Administration support. . . . Its enactment certainly would do more than merely end the breathing spell. . . .

Inasmuch as the Administration is expected to control the present Congress, just as it has completely controlled it heretofore, the legislative program largely may be expected to be whatever the Administration wants. . . . At least, sufficiently so that business and industry can discount a lot of wild proposals that have been jammed into the legislative hoppers, with more to come and with accompanying plans for inquiries and investigations of all sorts centering around business and industry. . . .

From the angle of foolish legislative proposals, the present session started off auspiciously. . . . For the No. 1 bill, dropped in the hopper the day before Congress convened, would place a Federal tax on so-called labor-displacing machinery. . . . The author is Representative Schulte of Indiana. . . . Numerous such bills have been offered in prior sessions and the number will be further increased at the present session. . . . Their authors' expectation that they wil get nowhere will be realized. . . . The supposed purpose of the bill is, that by sticking to horse-and-buggy methods of production, more labor will be required and the taxes would continue until unemployed get work. . . . Reams of argument to show that technological employment increases work are unimpressive to political advocates of discouraging work in the fields of science, invention, engineering and social progress. . . . Why not counter-legislation? . . . For instance, make it compulsory that advocates of taxes on labor-saving machinery travel by covered wagon, live in houses and offices heated by wood stove burners, bathe in wash tubs and turn their $10,000 salaries over to the unemployed. . . .

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Guffey Coal Commission Nipped Again

The National Bituminous Coal Commission is finding the going hard, as it was predicted it would, in administering what is popularly

known as the Goofey coal act. . . . Only recently the commission found it necessary to back down on its rigid order that all concerns supplying services or materials to the Government must use code coal. . . . When the American Telephone & Telegraph Co. raised a kick against the requirement that it use such coal in heating its offices, the commission found it convenient to exempt telephone and telegraph companies. . . .

Now Controller General J. R. McCarl, well-known hairshirt to this and former administrations, has nipped the commission. . . . He has ruled that it cannot require that contractors furnishing "provisions" use nothing but code coal produced. . . . The act itself, now under attack as to its constitutionality, authorizes the Government to require use of code coal produced in connection with contracts for "any public work or service." . . . The Controller General said, however, that this term cannot be construed to include contracts for the furnishing of supplies or other materials. . . . The ruling was the outgrowth of Government rejection of a bid from a dairy company when it eliminated the requirement as to the use of code coal. . . .

In short, the ruling says it is none of the Government's business what kind of coal a contractor or producer uses in supplying materials or service under a Federal contract. . . . Which is quite a jolt to bureaucracy. . . . As are wholesale refusals to pay processing taxes and wholesale court injunction suits. . . . Nevertheless, the act was jammed through Congress, "however reasonable the doubt as to its constitutionality. . . ."

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Simplified Practice Recommendation Reaffirmed

Division of Simplified Practice, National Bureau of Standards, Department of Commerce, has announced that simplified practice recommendation R57-32, Wrought Iron and Wrought Steel Pipe, Valves and Fittings, has been reaffirmed without change by the standing committee of the industry.

▼ ▼ ▼

Colonel To Serve As FTC Head

Col. Charles H. March has been designated to serve as chairman of the Federal Trade Commission for the calendar year 1936, effective Jan. 1. He succeeds Commissioner Ewin L. Davis, who has served in that capacity during the last year. Under the commission's custom, the chairmanship rotates annually.

This will be Colonel March's second term as chairman of the Federal Trade Commission. He was appointed to that Commission in 1929 for a term expiring September 25, 1935, and was reappointed by President Roosevelt last September for a full term of seven years, expiring in 1942. Colonel March served as chairman during 1933.

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Imports from Belgium Increase

Tariff reductions granted by the United States in the Belgian-American trade agreement were reflected in an increase in Belgian shipments of iron and steel to the American market in the first nine months of 1935 to 45,628 tons from 28,118 tons in the corresponding period in 1934.

Total Belgian exports of iron and steel products in the first nine months of 1935 declined to 2,490,-314 tons from 2,502,600 tons in the similar period of 1934.

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Business Census Started

A census of business, covering the calendar year 1935, got under way on Jan. 2. William L. Austin, director, Bureau of the Census, Department of Commerce, pointed out that this project is an elaboration of the Census of Distribution, covering 1929, and the Census of American Business, 1933, and would make available a complete picture of American business. "It will provide complete and basic data for the extensive field of business not included in the limited fields of manufacturing and distribution embraced in the existing census statistics, or otherwise obtainable," Mr. Austin said.

"It is the purpose of this census to present a true picture of the state of business for the calendar year 1935," Mr. Austin said. "It will also make available a much needed basis of comparison with conditions reported in 1929 and 1933. The scope includes: Retail trade; wholesale trade; hotels; insurance brokers or agents; distribution of manufacturers' sales; construction; trucking and warehousing; banking; bus transportation; operation of non-residential buildings; broadcasting and advertising agencies. It will furnish statistics on a national scale of the number of establishments, volume of business, persons employed, wages paid, and other vital facts."

President Flays Business Critics in Spectacular Night Opening of Congress

WASHINGTON, Jan. 7.—Bitterly resentful of widespread attacks on the New Deal, President Roosevelt in flaming phrase and rancorous tone assailed his critics in the business and industrial world in the course of his remarkable message to Congress on the "state of the union" Friday night. Never before in the history of the country has such an exhibition been staged. Except for its discussion of international affairs and proposed neutrality policy, the message had little or nothing to do with the "state of the union." And never before did a President reach such a vast audience. For he spoke to the world at large, thanks to a radio hookup. Also the hour was timed so that he could reach the ears of most of the nation instead of addressing the joint session of Congress when it opened at the noon hour. In the past all Presidents have either sent or read their messages on the "state of the union" immediately upon the convening of Congress. But, aside from political criticism, the timing of the message did not meet with general disapproval. The contrary is likely true.

Chief criticism lay in the use the President made of the spectacular setting. It was freely charged that he diverted it from a discourse on national and international problems, and took occasion to make of it his opening campaign speech. Moreover, many assailed it as a deliberate rabble rousing tirade. Playing to groups, it was maintained that it was clearly a political platform of challenge to business and industrial critics and an appeal to labor, agriculture and other groups, as though such groups in the national life are separate political divisions.

Manifestly there were all shades of opinion as to both the character and effect of the address. Those supporting the New Deal said it was a splendid effort and politically shrewd. Opponents dubbed it as being bereft of statesmanship, certainly as to domestic issues, and of thinly veiled political substance. It is their view that the reaction from the message will be much more unfavorable than favorable. It can be safely said it was an amazing document.

Two Schools of Business?

In his assault on critics, the President painstakingly sought to

make a division within business and industry. Whereas the popular view is that business and industry largely are opposed to the New Deal, the President affected the conviction that opposition "is, indeed, numerically small and, while it exercises a large influence and has much to say in the world of business, it does not, I am confident, speak the true sentiments of the less articulate but more important elements that constitute real American business."

In taking this attitude, the President reflected a habitual administration posture. The opposition is always in the minority and it is tagged with ugly terms, such as "power-seeking minority," "greedy," "devoid of vision," and whatnot. Constructive accomplishment, "ideal of public interest" and vision and all the good things have been born of the New Deal as opposed to "the clamor of many private and selfish interests" and the "clamor of partisan interest."

"Now, after 34 months of work," the President told the world, "we contemplate a fairly rounded whole. We have returned the control of the Federal Government to the City of Washington." In doing so, he said, "we have invited battle" and "we have earned the hatred of entrenched greed." The President said it was necessary to drive "some people from power and strictly to regulate others." He recalled his promise in his inaugural address to drive the money changers from the temple."

Though the President affected the view that only a small minority of business and industry are critical of the New Deal it was an interesting fact that such large organizations as the National Association of Manufacturers, the Chamber of Commerce of the United States and the American Liberty League appeared to accept as a matter of course and as though flattered that they were made the brunt of the Presidential attack. Sharp replies to the attack plainly indicate that the political campaign is going to be extremely heated and that it will be marked by an unprecedented rift between business and industry on the one hand and an Administration on the other. To say the least, it is not a pleasant outlook in the way of promoting recovery based upon cooperation between Government and business.

A Challenge To Critics

Despite the fact that different business organizations have opposed New Deal legislation and made specific suggestions for repeal or modification, the President called upon his critics to be consistent and propose repeal of the New Deal in its entirety if they believe the Administration's policies have hindered rather than promoted recovery. His suggestion that Congress should find means to protect its prerogatives and laws until final adjudication by the highest tribunal of the land was a source of considerable puzzlement. Nevertheless, many interpreted it as a sort of oblique reference to the Supreme Court, and to its disposition of the mass of New Deal legislation before it and to what Congress might do in the way of restricting the power of the court if it should nullify such legislation.

The message virtually was without recommendations. Some saw in this omission a desire to restrict legislation and thus to continue the so-called breathing spell. Others took an opposite view. They contended that the President has left the door wide open for any proposals that may be suggested by himself or others which he thinks will be popular and can be enacted into law.

He declared that on the basis of "existing laws" additional taxes were not necessary. It was already a foregone conclusion that, since this is a campaign year, further tax legislation at the present session would be politically unwise and therefore not proposed. It is of course inevitable after election. Moreover, social security legislation at the prior session constituted heavy taxation on employers, taxes to become payable next year. At the same session Congress enacted a soak-the-rich tax program. The latter will not approach tax requirements to cover interest on and retirement of the huge national debt, still mounting and to be sharply upped at the present session. The largest outlay will be some $2,000,000,000 for payment of the soldiers' bonus which will be enacted through support of members of both parties, fearful of defeat unless they do so.

Major Berry Holds Second Conference With Large Industries Unrepresented

WASHINGTON, Jan. 7.—With major industries of the country not represented, the so-called council for industrial progress was organized here yesterday under the sponsorship of Major George L. Berry, coordinator for industrial cooperation. The steel, automobile, metal-working, lumber, textile and other large employing industries were conspicuously without representation.

The meeting which is continuing today is being held behind closed doors. It is being attended by 90 members of the management and 30 members of the labor group. All of the latter are members of the American Federation of Labor.

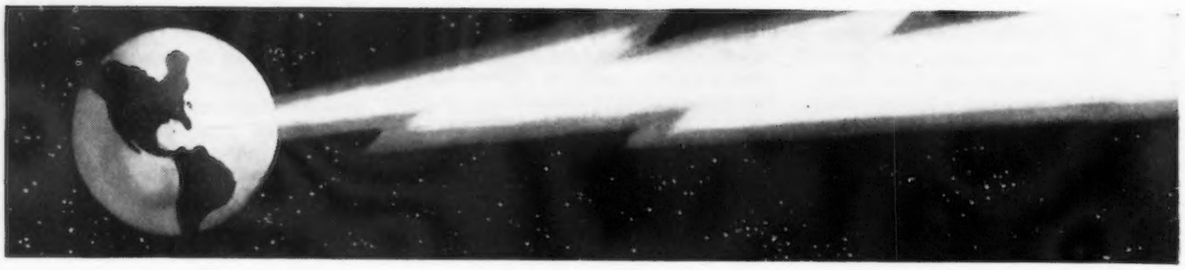
The meeting is in strong contrast to the first one held in December, when major groups flatly rejected Berry's plans for organizing industry and labor for the purpose of determining a so-called recovery policy. This latter meeting had been opened with some 2500 representatives of industry present.

In a statement Major Berry deplored the absence of these groups but insisted that the council is a going concern, though many seriously doubt that it will accomplish much or will long endure. Berry said that the council marks for "the first time in the history of the nation when representatives of management and labor have met and sought to find a solution for the economic maladjustment existing in our industrial life."

He pointed to the conference as proving to those opposed to it that it was not called to revive NRA, that it was not a move behind the scenes to tighten Government control over industry and that there never has been any intention to oppose or block any plans made individually by industries to accentuate recovery and create employment.

While the statement spoke of the conference as being harmonious and unanimous in its action, it is understood that considerable discord developed when members of the management group put forth for discussion the question of Government competition with private industry. Berry had not included this subject in the rather lengthy program which he had suggested for discussion. Subjects being considered include hours, wages, fair trade practices, child labor, anti-trust laws, competition under American standards, financial aid to small enterprises, etc.

President William Green of the American Federation of Labor was nominated permanent joint chairman to represent labor. The management group nominated John G. Paine of New York as their permanent joint chairman. Paine is chairman of the Music Publishers' Protective Association.



NEWS OF THE WEEK

Institute to Issue Revised Freight Rate Compilations

THE American Iron and Steel Institute has decided to reissue Institute Freight Rate Tariffs No. 1, applicable via water routes to the South Atlantic, Gulf and Pacific coast ports; No. 2, applicable to so-called Official Classification territory (east of the Mississippi and north of the Ohio and Potomac rivers); and No. 3, applicable to Southern territory, east of the Mississippi river.

The reissues will be in loose-leaf form as at present, but all subsequent rate changes will be effected through the issuance of revised pages instead of in the form of supplements as has been the practice heretofore. This will eliminate any necessity of posting changes and will make it possible to maintain tariffs currently up to date by merely substituting revised pages.

In response to the desires of various members of the industry, it has been decided to supply separately any part of the tariff showing rate data for any individual State in Tariffs No. 2 and No. 3, provided the order for such part covers five or more copies of the part relating to any one State. Such separate parts will be complete in and of themselves, including title page, rules and regulations, list of products upon which rates apply, pages of emergency charges and freight rates. Orders for such separate parts of any tariff must be placed prior to the time when such tariff goes to press.

The distribution of free copies will be discontinued and in lieu thereof a flat charge will be made for all tariffs and revised pages furnished. The following scale of prices will be charged:

	No. 1	No. 2	No. 3
New tariffs complete (without binders)..	$3.00	$8.00	$5.00
Individual part (State) (not less than five copies of a State to one subscriber) charge per sheet...	xx	0.06	0.06
Revised pages (charge per sheet)	0.03	0.03	0.03

Present Tariffs Nos. 1, 2 and 3 will be canceled as and when the new issues, which will be numbered 1-A, 2-A and 3-A respectively, shall have been distributed.

Detroit Foundrymen to Meet at Lansing

MICHIGAN STATE COLLEGE is joining with the Detroit chapter of the American Foundrymen's Association in holding a foundry conference at East Lansing, Mich., Feb. 7. The general subject for discussion will be the "Properties of Gray Iron Castings as Affected by Superheating Temperatures." The morning session, under the chairmanship of W. H. Spencer, metallurgist, Sealed Power Corpn., Muskegon, Mich., will be the occasion for the presentation of a report of an investigation carried out at the College Experiment Station by Messrs. Sefing and Surls. Phases of the subject will be discussed, as follows:

1. Gray Iron Structures and Their Effects on Physical Properties, by V. A. Crosby, Climax Molybdenum Corpn., Detroit.

2. The Effect of Superheating Temperature Alone on Gray Iron Mixtures, by Dr. Armand Di Guilio, Ford Motor Co., Detroit.

3. The Effect of Time at Superheating Temperatures on Gray Iron Mixtures, by H. S. Austin, The Buick Motor Co., Flint, Mich.

4. Relation Between Superheating, Size of Section and Structure of Gray Iron, by Harry Raynor, Dodge Brothers, Detroit.

5. The Influence of High Temperatures on the Chemical Analysis and the Effect of Small Changes in the Chemical Analysis on the Physical Properties, by R. G. McElwee, Detroit.

Vaughan Reid, president, City Pattern Works, Detroit, and chairman of the Detroit chapter, will preside at the evening dinner meeting. Local arrangements are in charge of Frederick G. Sefing of the staff of the college. All foundrymen and others interested are cordially invited to attend. No registration fee is being charged this year, as the length of the conference is limited to a one-day meeting, in view of the fact that the A. F. A. is to hold its annual meeting in Detroit during the week of May 4.

Sharon Steel Hoop Plans Reorganization

THE Sharon Steel Hoop Co. stockholders will vote on Feb. 27 on a proposal to change the company name to the Sharon Steel Corpn., issue a preferred stock, increase the number of authorized shares of common stock and to make other revisions in the capital structure. It is proposed to reduce the company's capital to $3,750,000 from $9,875,070 and to increase the authorized indebtedness by $7,000,000. The authorized capital stock would be increased to 1,070,000 shares, comprising 1,000,000 shares of common and 70,000 shares of preferred. Only 500,000 shares of common stock now are authorized.

The plans contemplate the re-

funding of the present bonded indebtedness amounting to $5,328,000, which it is intended to meet with the issue of preferred stock and debentures. Amendment of the articles of incorporation to provide for a more complete statement of the company's purposes also is proposed.

Pressed Steel Car Reorganization Plan

A PLAN filed recently at Pittsburgh under provisions of the Federal Bankruptcy Act provides for the establishment of the Pressed Steel Car Co. as a virtual subsidiary of the General American Transportation Corpn., which would put up $1,500,000, receiving in return 300,000 shares of new $5 par 5 per cent prior cumulative convertible preferred stock and 30,000 shares of new common stock. Various groups of security holders are strongly opposing the plan, the outcome of which remains doubtful. Under the plan 330,000 votes would be controlled by General American, compared with a total of 320,426 votes for other classes of stockholders.

Kempe's Engineer's Year-Book, 1936

THE 42nd annual edition of Kempe's Engineer's Year-Book, the well known compendium of modern practice in civil, mechanical, electrical, metallurgical and other branches of engineering, has been published by Morgan Brothers (Publishers), Ltd., 28 Essex Street, Strand, London, W.C.2, England. Text sections and index alone comprise more than 2650 pages, 4¾ by 7 in. The book has been carefully revised under the direction of Loughman Pendred, editor *The Engineer*, London, and a considerable amount of new material has been added, including an entire section dealing with acoustics, vibration and noise. Important additions have also been made to the sections dealing with steam and electrical engineering. The price of the 1936 Year-Book is 31s. 6d., net.

The bright annealing furnace pictured on page 27 of THE IRON AGE of Dec. 19, 1935, one of the illustrations in the article describing the manufacture of copper tubing at the plant of the Wolverine Tube Co., is a controlled-atmosphere electric furnace built by the General Electric Co.

Welding Symposium In Two Volumes

THE proceedings of the Symposium on the Welding of Iron and Steel, held in London, May 2-3, 1935, under the auspices of the Iron and Steel Institute, 28 Victoria Street, London, S. W. I., in cooperation with 15 other technical institutions, have been published in two bound volumes. These volumes, comprising 676 and 974 pages, respectively, cover some 150 papers by outstanding authorities from many countries. The papers are arranged in groups and subgroups, and each of the latter is prefaced by a summary and concluded with discussion and correspondence. Illustrations are generous in number.

Volume I is devoted to present day practice and problems in the engineering industries. The first group of papers covers bridge and structural engineering; pressure vessels, including boilers, pipe lines, tubes, tanks and vessels for use at high temperatures and pressures; railway material; and shipbuilding. The second group covers the airplane, automobile, chain, electrical, heavy engineering and machinery manufacturing industries; iron and steel castings; and wrought iron.

Welding practice and technique, including welding apparatus, are covered in the first group of papers in Volume II. The metallurgy of welding; and the specification, inspection testing and safety aspects of welding are other groups.

Coast Distributer Changes Name

DUCOMMUN CORPN., one of the oldest supply houses on the Pacific Coast, distributer of tools, metals, mill supplies, pipes and fittings, changed its name to Ducommun Metals & Supply Co., effective January 2.

The company is one of the oldest establishments of its kind on the Pacific Coast. Its founder established the business in 1849, in a one-story building on the corner of Main and Commercial Streets, Los Angeles. At present, the company occupies four warehouses in the city of Los Angeles, an oil country tubular storage yard at Wilmington, Cal., and recently made additions to its warehouse facilities in San Francisco, which, when completed, will represent an expenditure of $200,000.

The San Francisco branch for the past 18 years, has made a specialty of non-ferrous metals, alloy steels and kindred items. A complete stock of general supplies is now being added.

Electrical Business Gained in 1935

"THE volume of electrical manufacturing business in 1935 was approximately 30 per cent greater than in 1934, which was about the same increase as was shown for 1934 over 1933, asserted Gerard Swope, president, General Electric Co., in a year-end statement.

"Consumption of electricity in the United States was the greatest in the history of the country, being about 7 per cent more than in 1934 and 3 per cent more than in 1929, the previous peak year. This has been due largely to increased use of electrical appliances in the home. . . .

"Successive increases in the use of electricity must eventually mean an increase in the generating capacity of public utilities, which will bring an increase in orders for capital goods to the electrical manufacturing industry."

Taxes Represent 20 Per Cent of National Income

TOTAL tax collections for 1934 are estimated at 9.5 billion dollars, according to a recent analysis by the National Industrial Conference Board. This is lower than in 1930, when tax collections reached a total of 10.3 billion dollars.

This decline of about 8 per cent between 1930 and 1934 does not represent a decline in tax burdens, since declines in income were primarily responsible for the decrease in tax receipts.

For the period 1932 to 1934 the ratio of tax collections to national income averaged about 20 per cent, a much higher figure than in the years prior to the depression, when the ratio ranged between 10 per cent and 12 per cent.

The International Harvester Co. has placed an order for dies and steel stampings with the Edward G. Budd Mfg. Co., Philadelphia, for production on 1936 models.

PERSONALS

FRED E. KLING has been appointed assistant chief engineer, Carnegie - Illinois Steel Corpn., Pittsburgh. LOUIS C. EDGAR has been appointed chief engineer of the Pittsburgh district, and WARREN S. HALL has been made chief engineer for the Chicago district.

Mr. Kling is a graduate of the Royal Engineering College of Dortmund, Germany, and entered the employ of the Carnegie Steel Co. at Youngstown in 1902 as a draftsman and steam engineer. He became assistant chief engineer, Youngstown works, in 1906. He was chief engineer from 1912 to 1930, when he became chief mechanical engineer of the Carnegie Steel Co., with headquarters at Pittsburgh. When the Carnegie-Illinois Steel Corpn. was formed on Oct. 1, 1935, he was made chief engineer of the Pittsburgh district. He is a member of the American Iron and Steel Institute and American Society of Mechanical Engineers.

Mr. Edgar started with the Carnegie Steel Co. at Edgar Thomson works, Braddock, Pa., in 1905 as a draftsman. He was appointed assistant chief engineer in 1907, and chief engineer in 1916, and has served in the latter capacity to date. He is a member of the Engineers Society of Western Pennsylvania, having served as a director, vice-president and president of that organization, and has served as a director of the Association of Iron and Steel Engineers.

Mr. Hall was graduated from Purdue University in 1905, and entered the employ of the United States Steel Corpn. in 1911 as a special electrician at the South works of the Illinois Steel Co. In 1917, he was appointed electrical engineer, becoming superintendent of shops and auxiliary departments in 1929, superintendent of engineering and construction in 1930, acting chief engineer and superintendent of auxiliary departments in 1932, and assistant general superintendent at the South works in Feb., 1935.

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HAROLD H. JUDSON, foundry superintendent, Goulds Pumps, Inc., Seneca Falls, N. Y., will present the American Foundrymen's Association exchange paper before the Institute of British Foundrymen. Mr. Judson is well known for his developments in the production of high strength iron for large pressure pump castings, his paper on this subject before the 1932 convention of the A.F.A. having been especially noteworthy. He also discussed shear tests for cast iron before the 1931 meeting of the American Society for Testing Materials. Following his graduation from Worcester Polytechnic Institute in 1923, he was for three years foundry engineer with the Riley Stoker Co., Detroit. In 1926 he entered the employ of Goulds Pumps, Inc., as foundry superintendent, his present position.

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ROBERT B. SKINNER has resigned as secretary-sales manager of the Skinner Chuck Co., New Britain, Conn., to become associated with LUCIUS E. WHITON, president, D. E. Whiton Machine Co., New London, Conn., as vice-president and general manager. Mr. Skinner has been in the chuck business ever since he left school, having learned the trade in the factory, and actually having built the product before taking complete charge of all sales promotional work. Thus, he has come into contact with all phases of the manufacturing and distributing ends of the chuck business.

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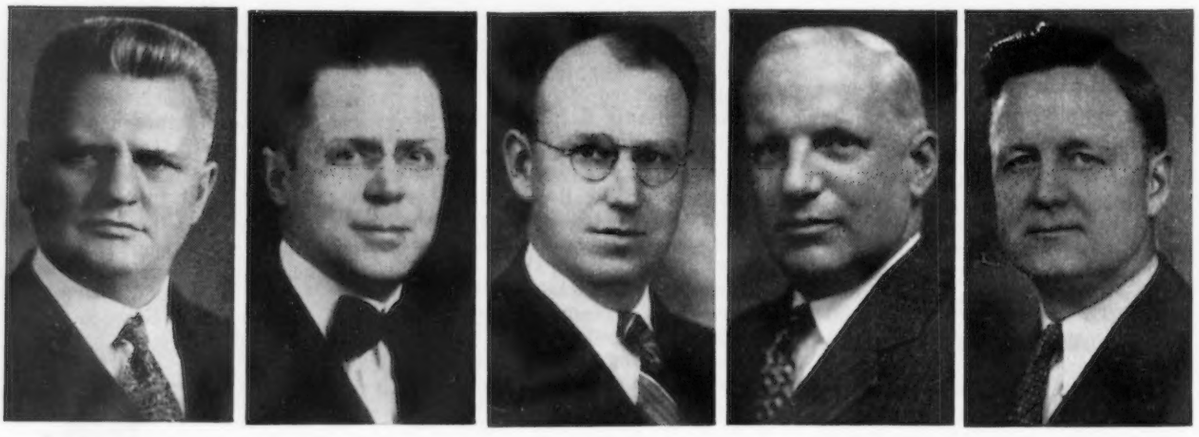
STANLEY A. RICHARDSON has been made general sales engineer for the Empire Sheet & Tin Plate Co., Mansfield, Ohio. In this capacity he will direct the various sales activities of the company. For the past five years Mr. Richardson has served as chief metallurgist for Empire. After completing his technical training at both the University of Minnesota and the University of Chicago, Mr. Richardson entered the steel industry and during the past 19 years has served that industry in both technical and executive positions. Prior to going with Empire, he was with Republic Steel Corpn., having held the position of chief metallurgist of Interstate Iron & Steel Co. at the time that concern was merged into Republic. Mr. Richardson holds membership in Sigma Xi (scientific honorary), Society of American Military Engineers, American Institute of Mining and Metallurgical Engineers, American Society for Metals, and others.

WILLIAM FOX, a graduate of Carnegie Institute of Technology



F. E. KLING | L. C. EDGAR | H. H. JUDSON | R. B. SKINNER | S. A. RICHARDSON

F. E. FISHER, recently appointed metallurgist for the St. Louis and Chicago offices of the Sloss-Sheffield Steel & Iron Co.

T. J. HILLIARD, new manager of sales in the Pittsburgh district for the Carnegie - Illinois Steel Corpn.

C. R. MOFFATT, advertising manager, Carnegie-Illinois Steel Corpn.

G. R. SCHREINER, assistant advertising manager, Carnegie - Illinois Steel Corpn.

and chief chemist of Empire for 15 years, has been appointed chief metallurgist, succeeding Mr. Richardson.

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REUBEN D. ABBISS has been appointed chief engineer, Edgar Thomson works, Carnegie-Illinois Steel Corpn., succeeding LOUIS C. EDGAR, who has been made chief engineer of the Pittsburgh district. Mr. Abbiss started with the Carnegie Steel Co. at the Edgar Thomson works in 1910 as an apprentice in the engineering department. Later he successively was special engineer and assistant to chief engineer, holding the latter position from 1924 until his current appointment. He was graduated from Pennsylvania State College in 1910.

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F. E. GAGE, formerly superintendent of the Farrel, Pa., works of the American Steel & Wire Co., has been appointed superintendent of the Consolidated Works in Cleveland, succeeding E. F. Brown, who has been made superintendent of the American Works, Cleveland. Mr. Brown succeeds Charles F. Kempert, long superintendent of the American Works, who has retired under the Steel Corporation's retirement plan.

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B. E. PHENEGER has been appointed superintendent of the Central Furnaces of the Carnegie-Illinois Steel Co., Cleveland. The two remaining furnaces of this group, formerly operated by the American Steel & Wire Co., are being repaired and will be placed in operation for the manufacture of merchant iron. Mr. Pheneger was for a long time assistant general superintendent of the Newburgh Steel works, Cleveland, and since the operation of that plant was discontinued about two years ago, has been dividing his time between the American Steel & Wire Co. and the Lorain plant of the National Tube Co.

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C. M. YODER, president and general manager of the Yoder Co., Cleveland, sailed Jan. 3 on a business trip to Europe and will spend six to eight weeks in England and France.

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JOHN B. THOMAS, who since 1929 has been general sales manager and comptroller of Mid-States Steel & Wire Co., Crawfordsville, Ind., has been appointed assistant manager, wire sales division, Wheeling Steel Corpn., Wheeling, W. Va. Prior to his connection with the Mid-States company, he was associated with the Keystone Steel & Wire Co., Peoria, Ill.

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F. A. MCCLELLAND, who for the past two years has been in the Cincinnati sales office of the Wheeling Steel Corpn., has been appointed assistant manager of the tubular sales division, with headquarters at Wheeling. He joined the company in 1933 after a nine-year connection with Clayton Mark & Co., Chicago, where he served as assistant sales manager.

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F. HUGHES MOYER has resigned as vice-president and director of Mackintosh-Hemphill Co., Pittsburgh. He had been associated with the company since 1926, when he was elected vice-president in charge of operations. When J. RAMSEY SPEER resigned the presidency of the company in 1928, Mr. Moyer became executive vice-president in direct charge of affairs of the company. He continued as vice-president and senior engineer when Colonel JAMES S. ERVIN was elected president in April, 1932. Mr. Moyer's career embraces wide experience in general steel works practice. He has been intimately associated with the industry since his graduation from Cornell University in 1899. He received his earlier training under E. E. SLICK, former chief engineer of Carnegie Steel Co. Mr. Moyer has contributed to the engineering development of several steel plants in this country, including the Clairton plant, Carnegie Steel Co., the Gary plant, Indiana Steel Co., and the Cambria Steel Co., Johnstown, Pa., in the capacity of chief engineer, as well as in operating capacities with Crucible Steel Co., Midland, Pa., and the former United Alloy Steel Corpn., Canton, Ohio.

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LEROY HOLT, purchasing agent of the Tennessee Coal, Iron & Railroad Co. since 1922, and with

the company since 1910, has been appointed head of the new sales promotion division, which has been established to develop new outlets and new uses for the company's steel products. RICHARD SHIVELY has been appointed purchasing agent to succeed Mr. Holt. Mr. Shively has been assistant purchasing agent since 1922 and prior to that was manager of the company's mercantile stores.

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A. F. MCGRAW, for the past four years industrial tractor sales manager at the Kansas City branch of the Allis-Chalmers Mfg. Co., Milwaukee, has been promoted to the position of sales promotion manager of the tractor division at the main works in Milwaukee. He succeeds W. ELZEY BROWN, who resigned Jan. 1 to establish new connections. Mr. McGraw, who has been connected with the tractor, farm equipment and road machinery industries for 24 years, will direct sales promotion of both industrial and agricultural tractor lines in his new capacity.

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WILLIAM C. DAVIS, formerly of the United States Gypsum Co., has been appointed director of merchandising for industrial materials and structural materials divisions of the Owens - Illinois Glass Co., Toledo, Ohio.

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GEORGE E. PFISTERER, who has been manager of the Chicago Power Show for several years, has been made western representative of Metal Products Exhibits, the permanent exhibition of metals, alloys, plastics and finishes located in the International Building, Rockefeller Center, New York.

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E. O. BRADY, formerly sales manager of the Stran Steel Corpn., Detroit, has been appointed regional manager for the plumbing ware division of the Briggs Mfg. Co. In his new connection, Mr. Brady will represent Briggs in the southern territory where he will contact master plumbers and plumbing jobbers on behalf of the company's new line of formed metal plumbing ware.

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K. W. ATWATER, well-known rolling mill engineer, who until three years ago was connected with H. A. Brassert & Co., consulting engineers, Chicago, has become associated with the Birdsboro Steel Foundry & Machine Co., whom he will represent in the western Pennsylvania and eastern Ohio districts beginning Jan. 1, with office at 413 Investment Building, Pittsburgh.

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JEROME E. SWEET and RICHARD M. SMITH have joined the sales and engineering staff of the Claude B. Schneible Co., dust arrester engineer, Chicago. Mr. Sweet, formerly in a sales capacity with the American Foundry Equipment Co., will work as sales engineer and Mr. Smith, formerly with the Dodge Mfg. Co., will fill the position of field engineer.

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CHARLES L. CRUIKSHANK has been appointed manager of the ceramic department of Great Lakes Foundry Sand Co., Detroit. Mr. Cruikshank, a graduate of the University of Michigan, has been interested in the non-metallic minerals industry for several years and will be actively engaged in the sale of Nepheline Syenite, a new ceramic raw material.

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W. H. BRALEY, who started employment with the National Tube Co., Ellwood works, in 1912, and for the past eight years has been acting in the capacity of field engineer, became associated with Peter A. Frasse & Co. on Jan. 1, as field engineer, specializing on "Shelby" seamless steel tubing.

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DAVID J. GEMMELL has been named general sales manager of the Cleveland Chain & Mfg. Co., Cleveland. He has had many years' experience in welded chain, weldless chain and also tire chain lines. For a number of years past he has been in charge of the Chicago office handling Midwestern sales.

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DEL S. HARDER has been named resident manager of the new plant to be constructed for the Grand Rapids Stamping Division of General Motors Corpn. at Grand Rapids, Mich. From 1914 to 1922 he was with General Motors in charge of testing with headquarters in New York and also as superintendent of the Janesville, Wis., plant. From 1922 to 1928 he was with another large motor car company, first as superintendent, then factory manager and finally as director of standards. In the succeeding six years he served as works manager of the Edward G. Budd Mfg. Co.'s factories in Philadelphia and Detroit. During the past year he has been attached to the staff of Thomas P. Archer, vice-president in charge of operations of Fisher Body.

D. S. HARDER

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DR. A. A. POTTER, dean of schools of engineering, Purdue University, has been nominated as president of American Engineering Council for 1936-37, to succeed J. F. COLEMAN, of New Orleans. Dean Potter will take office at the annual meeting of the council to be held Jan. 9, 10, and 11 when representatives of national, State, and local engineering societies will convene in Washington. Dean Potter is a past president of the American Society of Mechanical Engineers, the Society for the Promotion of Engineering Education, the Indiana Engineering Society, and the Kansas Engineering Society, which are member bodies of the national Council.

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JESSE R. HARLAN, recently appointed sales promotion manager of the Yale & Towne Mfg. Co., Philadelphia, has been associated with the materials handling equipment industry for more than 15 years, beginning his career as advertising manager of the Stuebing-Cowan Co., Cincinnati. Shortly after the Cowan Truck Co. was merged with the Stuebing Co. in 1926, he was sent to Holyoke, Mass., where he handled the sales and advertising for the Cowan division. In 1929, The Stuebing-Cowan Co. was absorbed by the Yale company, and a year later Mr. Harlan established himself in the advertising agency business in Cincinnati, where he specialized in industrial accounts.

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JOHN S. ANDREWS, formerly manager of sales, Rotary Electric Steel Co., Detroit, has been named vice-president in charge of sales. Other officers of the company are: H. N. Naugle, president; W. H. Colvin, Jr., secretary - treasurer. J. P. Doane is manager of service.

OBITUARY

HARRY L. HORNING, president and founder of the Waukesha Motor Co., manufacturer of internal combustion engines for automotive, agricultural and industrial uses, Waukesha, Wis., died at Battle Creek Sanitarium, Battle Creek, Mich., Jan. 4 at the age of 55. Besides being a leading manufacturer in his field, Mr. Horning was also an engineer and inventor of note. He was a pioneer in developing octane tests to determine the anti-knock qualities of motor fuels, and a fuel research engine used by the American Petroleum Institute as a standard for measuring gasoline by octane number and Diesel fuels by centene number was named after him as a recognition of his work. During the war Mr. Horning was chairman of the automotive production section of the War Industries Board. In 1925 he was elected president of the Society of Automotive Engineers, after having served four years as its first vice-president. In 1926 and 1927 he was president of the Motor and Accessory Manufacturers Association. Mr. Horning's first business connection, after attending Carroll College, Waukesha, Wis., was in the chemical laboratory and operating department of the Milwaukee Gas Light Co. in 1901. Later he spent two years in the steam engineering department of the Crane Co. From 1904 to 1906 he was head of the mechanical engineering department of the Modern Structural Steel Co., Waukesha. In 1906 he established the Waukesha Motor Co.

H. L. HORNING

W. MacGREGOR

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WILLIAM MACGREGOR, general sales manager of the Carborundum Co., Niagara Falls, N. Y., died after a long illness at the Polyclinic Hospital, New York, on Dec. 18, aged 47 years. He joined the sales staff of the company in 1912 and six years later became sales manager of the stone and marble, and the paper and cloth departments, with headquarters at Niagara Falls. He was made general sales manager of the company in 1926.

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J. G. OBERMIER, vice-president in charge of production and member of the board of directors of the Timken Roller Bearing Co., Canton, Ohio, died of pneumonia in Tucson, Ariz., on Dec. 28, aged 67 years. After working for a number of years in Cleveland, he went to Canton, and in 1912 joined the Timken organization as superintendent of production. He was in active charge of production through the intensive development period of the company. In 1921, Mr. Obermier was elected to the board of directors and appointed vice-president in charge of production, which position he filled actively until within a few weeks of his death.

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CHARLES F. COLLINS, retired Steel Corporation official and resident of Chicago for 67 years, died recently at Miami, Fla. Mr. Collins was born in Chicago and had been raw material manager for the United States Steel Corpn. for seven years previous to his retirement in 1919. He also served as purchasing agent for the American Steel & Wire Co. for 10 years.

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WILLIAM W. MILLER, manager of the industrial department of the General Electric Co., Schenectady, N. Y., died in that city after an appendicitis operation on Dec. 22, aged 55 years. He was graduated from the Union Classical Institute in 1897 and worked for a year as office boy in the company offices. After his return from the Spanish-American war, he rejoined the company in the armature and coil-winding department. He entered the student engineering course in 1900 and two years later was transferred to the industrial department. He was made assistant manager in 1920 and manager of that division in 1929.

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JAMES GOFF, who since 1933 was plant manager of Scully Steel Products Co., a subsidiary of United States Steel Corpn., died suddenly on Dec. 24 at Pittsburgh, aged 46 years. Previous to his connection with Scully he had been warehouse superintendent at Pittsburgh for the Carnegie Steel Co. He was a graduate of Massachusetts Institute of Technology.

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WILLIAM G. KAYSING, president of the Kaysing Iron Works, St. Louis, died recently at his home at the age of 63 years.

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DWIGHT CLARK, a director of the Jones & Laughlin Steel Corpn., Pittsburgh, died on Dec. 27 at Philadelphia after a long illness, aged 66 years. He was graduated from the Massachusetts Institute of Technology in 1897.

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WILLIAM B. BELDEN, general counsel for the Republic Steel Corpn. and the Cleveland Cliffs Iron Co. and a director of both companies and also of the Lake Superior & Ishpeming Railroad Co., a Cleveland Cliffs subsidiary, died at his home in Cleveland, Dec. 24, aged 62 years. After his graduation from the Cornell University Law School in 1895, Mr. Belden practiced law in Grand Rapids, Mich., until 1903 when he moved to Ishpeming, Mich., as legal representative of the Cleveland Cliffs Iron Co. and other iron ore companies. He removed to Cleveland in 1917 as general counsel for the Cleveland Cliffs company. His most important recent legal work was as counsel in the successful defense of the Republic Steel Corpn. and of the former Corrigan, McKinney Steel Co. against the Federal government's suit to prevent their merger.

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ALBERT C. NIEMAN, for 27 years a sales engineer of the Gisholt Machine Co., Madison, Wis., died on Dec. 27, at Detroit, where he had been stationed during the past seven years. He was 55 years old.

December Pig Iron Output Declines Slightly

PRODUCTION of coke pig iron during December amounted to 2,106,453 gross tons, compared with 2,065,913 in the preceding month and with 1,027,622 tons in December, 1934. However, the daily rate last month declined 1.3 per cent, or from 68,864 tons to 67,950 tons.

Total pig iron output in 1935 was 21,007,802 tons, compared with 15,911,188 tons in the preceding year. Furnaces produced iron last year at a rate of 57,556 tons daily, compared with 43,592 tons daily in 1934, a gain of 32 per cent.

There were 119 stacks making iron on Jan. 1, at a rate of 66,825 tons daily, compared with 122 furnaces operating one month before which were producing iron at a rate of 70,095 tons daily. Two stacks were blown in during the month and five were taken out, a net loss of three. The Steel Corporation blew in two furnaces and took off one, while independent steel companies blew out or banked three units. One merchant stack was blown out.

The furnaces blown in were a Gary stack of the Carnegie-Illinois Steel Corpn. and an Ensley furnace of the Tennessee Coal, Iron & Railroad Co. Blown out were one Donner of the Republic Steel Corpn., two Eliza of the Jones & Laughlin Steel Corpn., one Lorain of the National Tube Co. and the merchant stack of the Troy Furnace Corpn.

Merchant Iron Made, Daily Rate

Tons

	1935	1934	1933	1932
January	3,926	7,800	2,602	6,256
February	6,288	7,071	2,863	7,251
March	7,089	7,197	2,412	7,157
April	8,799	8,838	1,908	5,287
May	8,441	9,099	3,129	4,658
June	7,874	9,499	4,088	6,090
July	8,644	7,880	6,783	3,329
August	8,194	6,043	7,756	3,070
September	10,090	4,986	10,034	3,213
October	11,199	5,765	8,634	4,286
November	12,503	6,610	7,639	4,435
December	13,312	4,399	8,358	3,674

Daily Average Production of Coke Pig Iron

Gross Tons

	1935	1934	1933	1932
January	47,656	39,201	18,348	31,380
February	57,448	45,131	19,798	33,251
March	57,098	52,243	17,484	31,201
April	55,449	57,561	20,787	28,430
May	55,713	65,900	28,621	25,276
June	51,750	64,338	42,166	20,935
½ year	54,138	54,134	24,536	28,412
July	49,041	39,510	57,821	18,461
August	56,816	34,012	59,142	17,115
September	59,216	29,935	50,742	19,753
October	63,820	30,679	43,754	20,800
November	68,864	31,898	36,174	21,042
December	67,950	33,149	38,131	17,615
Year	57,556	43,592	26,199	23,733

Production of Coke Pig Iron and Ferromanganese

Gross Tons

	Pig Iron*		Ferromanganese†	
	1935	1934	1935	1934
January	1,477,336	1,215,226	10,048	11,703
February	1,608,552	1,263,673	12,288	10,818
March	1,770,028	1,619,534	17,762	17,605
April	1,663,475	1,726,851	18,302	15,418
May	1,727,095	2,042,896	17,541	10,001
June	1,552,514	1,930,133	12,961	10,007
½ year	9,799,000	9,798,313	88,902	75,642
July	1,520,263	1,224,826	13,175	10,188
August	1,761,286	1,054,382	12,735	8,733
September	1,776,476	898,043	15,983	7,100
October	1,978,411	951,062	19,007	9,830
November	2,065,913	956,940	18,245	8,134
December	2,106,453	1,027,622	17,126	4,563
Year	21,007,802	15,911,188	185,173	124,190

*These totals do not include charcoal pig iron. The 1934 production of this iron was 25,834 gross tons.
†Included in pig iron figures.

Production by Districts and Coke Furnaces in Blast

Furnaces	Production (Gross Tons) December (31 Days)	Production (Gross Tons) November (30 Days)	January 1 Number in Blast	January 1 Operating Rate, Tons a Day	December 1 Number in Blast	December 1 Operating Rate, Tons a Day
New York:						
Buffalo	151,189	140,696	7	4,325	8	4,690
Other New York and Mass.	11,170	21,178	1	210	2	765
Pennsylvania:						
Lehigh Valley	38,124	36,156	3	1,230	3	1,205
Schuylkill Valley	21,724	19,465	2	700	2	650
Susquehanna and Lebanon Valleys	9,228	11,157	1	300	1	370
Ferromanganese	....	....	0	....	0	....
Pittsburgh District	386,383	407,431	21	12,075	23	14,015
Ferro. and Spiegel	9,864	9,350	2	320	2	310
Shenango Valley	35,654	35,411	2	1,150	2	1,180
Western Pennsylvania	42,645	47,574	3	1,375	3	1,585
Ferro. and Spiegel	4,262	6,006	1	135	1	200
Maryland	71,399	84,993	4	2,305	4	3,270
Wheeling District	148,410	135,475	7	4,790	7	4,515
Ohio:						
Mahoning Valley	208,047	193,886	9	6,710	9	6,000
Central and Northern	219,087	214,321	11	6,540	12	7,145
Southern	42,885	45,913	4	1,385	4	1,530
Illinois and Indiana	425,231	412,574	20	14,075	19	13,750
Mich. and Minn.	80,661	78,541	5	2,600	5	2,710
Colo., Mo. and Utah	20,563	22,184	2	665	2	740
The South:						
Virginia	....	....	0	....	0	....
Ferro. and Spiegel	2,990	2,889	1	95	1	95
Kentucky	14,223	13,094	1	460	1	435
Alabama	162,714	127,619	12	5,380	11	4,935
Tennessee	....	....	0	....	0	....
Total	2,106,453	2,065,913	119	66,825	122	70,095

Horace T. Potts Co. Is Reorganized

HORACE T. POTTS CO., a Philadelphia, Pa., warehouse interest, has just announced the formation of a new co-partnership formed by Harrison I. Potts, Thomas C. Potts, Horace M. Potts, Guy P. Bible and Morris E. Neeley. The former company name will be retained unchanged.

Republic Asks Leave To Issue Bonds

WASHINGTON, Jan. 7.—Permission to issue general mortgage bonds aggregating $45,000,000 was asked today of the Securities Exchange Commission by the Republic Steel Corpn. The maturity date of the bonds is Feb. 1, 1961.

The Railroad Credit Corpn. had $46,389,249 of loans outstanding at the close of the year, according to the corporation's report filed with the Interstate Commerce Commission.

Supreme Court Decision on AAA Completes Wreck of Major New Deal Legislation

WASHINGTON, Jan. 7.—The New Deal's agriculture program having been knocked out as unconstitutional by the Supreme Court in its 6 to 3 decision Monday, its two great cornerstones of "economic planning," the NRA and AAA, have been reduced to ashes.

While far-flung reverberations are awaited from the smashing opinion killing AAA, attention now is being directed toward further pending decisions, which may leave the New Deal all but a shambles. Especially in mind is the Guffey coal act, soon to face the highest judicial tribunal in the land. While it had been freely predicted, even before the AAA decision, that the Guffey act would be held unconstitutional by the Supreme Court because of the finding in the Schechter NRA case, the AAA opinion emphasized the belief that the Guffey act is slated for the discard.

The majority decision in the AAA case held that the AAA program was an invasion of the rights of the States and was not voluntary. Mr. Justice Roberts, who read the majority opinion, said that control of crop production even if by voluntary agreement and payment of bounties exceeded the limitation of the power of the Federal Government. Use of taxes for the purpose of penalties to enforce the act is also the heart of the Guffey coal control act as against the prescribed legal principle that taxes can be raised only for revenue purposes. The invasion of State rights also is involved in the Guffey act as it is in New Deal acts yet to be passed upon.

On this principle it is believed, however, that such an outstanding New Deal law as the social security act will stand the court test. Other acts already before or yet to come before the Supreme Court are such prominent ones as TVA and security exchange law, which, however, involve principles different from those surrounding AAA. It is expected that the finding in the AAA act will knock out the Bankhead cotton, potato control, Kerr-Smith and Jones-Costigan acts.

While the New Deal perhaps expected an adverse decision in the AAA case it was nevertheless shocked by it. In striking contrast to its reaction when the NRA decision was handed down and called forth long Presidential comment bitterly denominating it as a "horse and buggy" decision, the White House was silent when the AAA opinion came out. The President, Attorney General Cummings, Secretary of Agriculture Wallace and Congressional leaders began a series of conferences to analyze the decision and no comment was to be made, it was said, until the study had been completed.

Steel Ingot Production in 1935 Was 30.57 Per Cent Above Total 1934 Output

WITH the daily rate of steel ingot production during December at the highest level of the year, total output of Bessemer and open-hearth steel ingots in 1935 was 33,425,576 gross tons, according to the American Iron and Steel Institute. This was a gain of 30.57 per cent over the 1934 production of 25,599,118 tons and was the largest total since 1930. Steel was produced at a rate of 107,478 tons daily in 1935, compared with 82,312 tons daily in 1934 and the industry's capacity was engaged at 48.55 per cent, compared with 37.38 per cent in the preceding year.

December production amounted to 3,081,807 tons, compared with 3,153,247 tons in November. However, in view of the fact that the final month of the year had only 25 working days, the daily rate was 123,272 tons, the highest since May, 1934. Available capacity was engaged at 55.68 per cent of capacity, the highest rate of the year. This compares with 54.78 in November and with 57.18 in May, 1934.

REPORTED BY COMPANIES WHICH IN 1934 MADE 97.91 PER CENT OF THE OPEN-HEARTH AND 100 PER CENT OF THE BESSEMER INGOT PRODUCTION

	Reported Production (Gross Tons)		Calculated Monthly Production—All Companies		Number of	
1934	Open-Hearth	Bessemer	Monthly	Daily	Working Days	Per Cent of Operation
January	1,786,458*	172,489	1,997,129†	73,968†	27	33.59†
February	1,993,465*	175,873	2,211,944†	92,164†	24	41.86†
March	2,540,243*	203,904	2,798,440†	103,646†	27	47.07†
April	2,622,531*	257,482	2,936,064†	117,443†	25	53.34†
May	3,003,676*	331,620	3,399,494†	125,907†	27	57.18†
June	2,718,782*	282,592	3,059,483†	117,672†	26	53.44†
July	1,340,924*	119,869	1,489,453†	59,578†	25	27.06†
August	1,245,139*	109,598	1,381,350†	51,161†	27	23.24†
September	1,127,269*	117,615*	1,268,977†	50,759†	25	23.05†
October	1,325,777*	127,789	1,481,902†	54,885†	27	24.93†
November	1,447,626*	132,059	1,610,625†	61,947†	26	28.13†
December	1,794,437*	131,467*	1,964,257†	78,570†	25	35.68†
Total	22,946,327*	2,162,357*	25,599,118†	82,312†	311	37.38†
1935						
January	2,576,671	239,858	2,871,531*	106,353*	27	48.04*
February	2,500,062	224,336	2,777,765*	115,740*	24	52.28*
March	2,582,211	230,810	2,868,141*	110,313*	26	49.83*
April	2,358,249	231,916	2,640,504*	101,558*	26	45.87*
May	2,331,297	254,796	2,635,857*	97,624*	27	44.10*
June	1,978,180	210,487	2,230,893	89,236	25	40.31
July	2,003,011	224,456	2,270,224	87,316	26	39.44
August	2,629,828	233,361	2,919,326	108,123	27	48.84
September	2,541,840	233,737	2,829,835	113,193	25	51.13
October	2,815,624*	270,719	3,146,446*	116,535*	27	52.64*
November	2,840,451	252,163	3,153,247	121,279	26	54.78
December	2,853,382	228,425	3,081,807	123,272	25	55.68
Total	30,590,512	2,835,064	33,425,576	107,478	311	48.55

*Revised.
†Adjusted.

Current Metal Working Activity Statistically Shown

These Data Are Assembled by The Iron Age from Recognized Sources and Are Changed Regularly as More Recent Figures Are Made Available.

	November, 1935	October, 1935	November, 1934	Eleven Months, 1934	Eleven Months, 1935
Raw Materials:					
Lake ore consumption (gross tons)[a]	3,020,315	2,910,863	1,298,404	20,608,200	27,755,564
Coke production (net tons)[b]	3,217,175	3,141,851	2,358,300	26,931,000	31,720,422
Pig Iron:					
Pig iron output—monthly (gross tons)[c]	2,065,913	1,978,411	957,000	14,883,626	18,901,349
Pig iron output—daily (gross tons)[c]	68,864	63,820	31,898	44,583	56,591
Castings:					
Malleable castings—production (net tons)[d]	44,277	43,467	28,515	336,712	420,797
Malleable castings—orders (net tons)[d]	47,778	45,246	28,530	317,641	410,038
Steel castings—production (net tons)[d]	25,643	26,352	25,799	426,171	361,195
Steel castings—orders (net tons)[d]	32,714	34,553	21,552	406,819	359,628
Steel Ingots:					
Steel ingot production—monthly (gross tons)[e]	3,153,247	3,146,446	1,610,325	23,634,861	30,343,769
Steel ingot production—daily (gross tons)[e]	121,279	115,414	61,947	82,639	106,097
Steel ingot production—per cent of capacity[e]	54.78	52.13	28.13	37.3	47.9
Employment in Steel Industry:					
Total employees[e]	438,370	436,554	381,663	411,440	423,186
Total payrolls (thousands of dollars)[e]	$49,171	$51,456	$32,937	$422,480	$506,308
Average hours worked per week[e]	35.7	36.8	26.3	30.7	34.1
Finished Steel:					
Trackwork shipments (net tons)[e]	3,090	3,495	2,065	46,838	39,204
Sheet steel sales (net tons)[f]	289,101	226,209	133,344	1,637,552	2,270,171
Sheet steel production (net tons)[f]	224,541	222,963	143,057	1,735,720	2,216,216
Fabricated shape orders (net tons)[g]	92,775	101,246	89,340	986,583	958,958
Fabricated shape shipments (net tons)[g]	87,833	96,809	110,560	1,027,535	1,014,814
Fabricated plate orders (net tons)[d]	19,116	30,530	16,629	215,967	227,731
Reinforcing bar awards (net tons)[e]	11,475	31,865	7,185	169,690	289,315
U. S. Steel Corpn. shipments (tons)[h]	681,820	686,741	366,119	5,539,847	6,709,784
Ohio River steel shipments (net tons)[i]	88,338	104,659	51,710	586,310	864,508
Fabricated Products:					
Automobile production, U. S. and Canada[k]	406,486	283,334	85,179	2,713,645	3,756,276
Construction contracts, 37 Eastern States[l]	$188,115,000	$200,595,700	$111,691,500	$1,450,423,500	$1,580,408,400
Steel barrel shipments (number)[d]	654,596	884,888	466,933	6,258,167	6,351,077
Steel furniture shipments (dollars)[d]	.....	$1,562,303	$1,038,951	$10,717,672	.....
Steel boiler orders (sq. ft.)[d]	.....	784,341	286,622	4,108,688	.....
Locomotive orders (number)[m]	0	0	69	163	28
Freight car orders (number)[m]	25	810	4	23,079	8,128
Machine tool index[n]	98.6	102.9	52.4	†44.2	†93.8
Foundry equipment index[o]	100.4	140.0	80.4	†60.7	†122.9
Foreign Trade:					
Total iron and steel imports (gross tons)[p]	56,637	59,569	35,272	297,053	416,461
Imports of pig iron (gross tons)[p]	15,550	17,168	6,055	111,828	114,648
Imports of all rolled steel (gross tons)[p]	17,089	24,444	10,600	105,806	194,851
Total iron and steel exports (gross tons)[p]	205,242	238,358	299,263	2,550,109	2,828,067
Exports of all rolled steel (gross tons)[p]	88,008	81,248	78,797	870,676	812,159
Exports of finished steel (gross tons)[p]	68,324	63,954	60,402	755,422	688,831
Exports of scrap (gross tons)[p]	104,961	145,850	216,566	1,639,193	1,902,429
British Production:					
British pig iron production (gross tons)[r]	525,100	544,300	507,600	5,465,000	5,862,700
British steel ingot production (gross tons)[r]	903,300	907,300	766,000	8,205,200	9,030,900
Non-Ferrous Metals:					
Lead production (net tons)[s]	39,957	42,618	34,809	375,081	378,699
Lead shipments (net tons)[s]	43,023	42,271	31,762	345,127	390,728
Zinc production (net tons)[t]	37,694	36,701	34,977	330,852	391,447
Zinc shipments (net tons)[t]	47,871	47,063	29,928	322,735	423,675
Deliveries of tin (gross tons)[v]	4,035	5,355	4,845	41,685	53,750

†Three Months' Average.

Source of figures: [a] Lake Superior Iron Ore Association; [b] Bureau of Mines; [c] THE IRON AGE; [d] Bureau of the Census; [e] American Iron and Steel Institute; [f] National Association of Flat-Rolled Steel Manufacturers; [g] American Institute of Steel Construction; [h] United States Steel Corpn.; [i] United States Engineer, Pittsburgh; [k] When preliminary, from Automobile Manufacturers Association—Final figures from Bureau of the Census; [l] F. W. Dodge Corpn.; [m] *Railway Age;* [n] National Machine Tool Builders Association; [o] Foundry Equipment Manufacturers Association; [p] Department of Commerce; [r] British Iron and Steel Federation; [s] American Bureau of Metal Statistics; [t] American Zinc Institute, Inc.; [v] New York Commodities Exchange.

Steel Production Rises 3½ Points to 51 Per Cent

Rebound Is Due Partly to Holiday Accumulation of Orders and Carryover Tonnages, Though Sizable Automotive and Railroad Inquiries Are Appearing

THE holiday interval, widely utilized in the steel industry for necessary repairs to equipment, has been followed by a sharp recovery in production, ingot output having risen from an average of 47½ per cent a week ago to 51 per cent of capacity.

The rebound was shared in by most producing centers, operations having risen four points to 39 per cent at Pittsburgh, three points to 50 per cent at Chicago, three points to 62 per cent in the Valleys, five points to 39 per cent in the Philadelphia district, nine points to 61 per cent in the Cleveland-Lorain area, five points to 45 per cent at Buffalo, four points to 72 per cent in the Wheeling district and two points to 57 per cent at St. Louis. The South was the only important district to show a loss, with output down 12 points to 38 per cent.

Part of the recovery in mill operations is based on orders that accumulated during the holiday period. There also has been a carryover of anticipatory orders for products that advanced in price Jan. 1, such as semi-finished steel, track bolts and spikes and cold-finished bars, on which most mills accepted specifications until the close of December for shipment during January. Pressure for steel on the part of the automobile industry has relaxed and there is a possibility that the initial bulge in motor car output is over, with the future trend of assemblies dependent on the course of retail demand. However, the appearance of sizable automotive inquiries in the Cleveland district, some of them covering February and March requirements instead of one month's needs, is an encouraging development.

AT Pittsburgh and Chicago, where railroad buying is on the upward trend, mills expect to accumulate substantial tonnages in heavy rolled products. The Santa Fe has supplemented its purchase of 58,302 tons of rails with orders for 17,804 tons of track accessories. The Bessemer & Lake Erie and the Union Railroad have issued formal inquiries for 3000 open-top freight cars, requiring more than 30,000 tons of steel, and for 25 locomotives.

Tin plate production has risen to 70 per cent of capacity as compared with 60 per cent a week ago and 40 per cent during Christmas week. Notwithstanding a large carryover of mill inventory, producers are still adding to stocks, so that they will be prepared to make prompt deliveries on all sizes when can companies begin to specify in volume.

Production of wire products in the Middle West now averages 55 per cent of capacity. The death of the AAA has caused momentary confusion among those selling to the farmer, though a number of interests serving the agricultural trade contend that the Government program has held down, rather than supported, the prices of farm products.

SCRAP markets are generally firm and THE IRON AGE composite price for heavy melting steel is unchanged at $13.33 a gross ton. Fuel markets are more buoyant because of inquiry from Great Britain. In anticipation of possible labor troubles in the Welsh coal fields, firm offers of prices on American bituminous lump, mine run and slack coal are being solicited.

The need for price advances on various finished steel products is still being urged, but progress in that direction is impeded by the persistence of weakness in scattered products, such as wire nails and concrete bars, and by demands of automotive stamping plants, refrigerator manufacturers and others for concessions on sheets equal to those recently granted certain motor car makers.

FABRICATED structural steel awards of 13,650 tons compare with 20,000 tons a week ago. New projects total 17,850 tons as against 16,450 tons in the previous week. Plate lettings of 12,112 tons include 6000 tons each for tanks for the Socony-Vacuum Oil Co. in Italy and for the Texas Co. in Texas City, Tex. Ten coal barges for which the Pittsburgh Coal Co. is inquiring will call for a total of 1500 tons of plates and shapes. Upward of 50,000 tons of iron and steel will probably be needed for the East River vehicular tunnel, New York, for which a PWA loan and grant of $58,365,000 has been authorized.

The PWA has reversed its position on the Miami, Fla., sheet steel piling contract, finally giving its approval to the city council's original distribution of the 3600 tons among four steel companies.

PIG iron production in December totaled 2,106,453 tons, or 67,950 tons a day, as compared with 2,065,913 tons, or 68,864 tons daily, in November. In terms of daily rate, output declined 1.3 per cent. Furnaces in blast Jan. 1 numbered 119 as against 122 on Dec. 1, a net loss of three. Total output for 1935 was 21,007,802 tons, compared with 15,911,188 tons in 1934, a gain of 32 per cent.

Steel ingot output in December was 3,081,807 tons compared with 3,153,247 tons in November. The December daily rate of 123,272 tons was the highest since May, 1934. Total output of Bessemer and open-hearth ingots in 1935 was 33,425,576 tons, a gain of 30.57 per cent over 1934.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous; Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

Per Gross Ton:	Jan. 7, 1936	Dec. 30, 1935	Dec. 10, 1935	Jan. 8, 1935
No. 2 fdy., Philadelphia	$21.31†2	$21.31†2	$21.31†2	$20.26
No. 2, Valley furnace	19.50	19.50	19.50	18.50
No. 2 Southern, Cin'ti	20.2007	20.2007	20.2007	19.13
No. 2, Birmingham†	15.50	15.50	15.50	14.50
No. 2 foundry, Chicago*	19.50	19.50	19.50	18.50
Basic, del'd eastern Pa.	20.8132	20.8132	20.8132	19.76
Basic, Valley furnace	19.00	19.00	19.00	18.00
Malleable, Chicago*	19.50	19.50	19.50	18.50
Malleable, Valley	19.50	19.50	19.50	18.50
L. S. charcoal, Chicago	25.2528	25.2528	25.2528	24.04
Ferromanganese, seab'd carlots	*75.00*	85.00	85.00	85.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$36.37½
Light rails, Pittsburgh	35.00	35.00	35.00	35.00
Rerolling billets, Pittsburgh	29.00	29.00	29.00	27.00
Sheet bars, Pittsburgh	30.00	30.00	30.00	28.00
Slabs, Pittsburgh	29.00	29.00	29.00	27.00
Forging billets, Pittsburgh	35.00	35.00	35.00	32.00
Wire rods, Pittsburgh	40.00	40.00	40.00	38.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.80	1.80	1.80	1.70

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.85	1.85	1.85	1.80
Bars, Chicago	1.90	1.90	1.90	1.85
Bars, Cleveland	1.90	1.90	1.90	1.85
Bars, New York	2.20	2.20	2.20	2.13
Plates, Pittsburgh	1.80	1.80	1.80	1.80
Plates, Chicago	1.85	1.85	1.85	1.85
Plates, New York	2.09	2.09	2.09	2.08
Structural shapes, P'gh	1.80	1.80	1.80	1.80
Structural shapes, Chicago	1.85	1.85	1.85	1.85
Structural shapes, New York	2.06¼	2.06¼	2.06¼	2.05¼
Cold-finished bars, Pittsburgh	**2.10**	1.95	1.95	2.10
Hot-rolled strips, Pittsburgh	1.85	1.85	1.85	1.85
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.60

Finished Steel

Per Lb.:	Jan. 7, 1936 Cents	Dec. 30, 1935 Cents	Dec. 10, 1935 Cents	Jan. 8, 1935 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.40
Hot-rolled annealed sheets, No. 24, Gary	2.50	2.50	2.50	2.50
Sheets, galv., No. 24, P'gh	3.10	3.10	3.10	3.10
Sheets, galv., No. 24, Gary	3.20	3.20	3.20	3.20
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.85
Hot-rolled sheets No. 10, Gary	1.95	1.95	1.95	1.95
Wire nails, Pittsburgh	2.40	2.40	2.40	2.60
Wire nails, Chicago dist. mill	2.45	2.45	2.45	2.65
Plain wire, Pittsburgh	2.30	2.30	2.30	2.30
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.35
Barbed wire, galv., P'gh	2.80	2.80	2.80	3.00
Barbed wire, galv., Chicago dist. mill	2.85	2.85	2.85	3.05
Tin plate, 100 lb. box, P'gh.	$5.25	$5.25	$5.25	$5.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$14.25	$14.25	$14.25	$13.25
Heavy melting steel, Phila.	12.50	12.50	12.50	11.00
Heavy melting steel, Ch'go	13.25	13.25	13.50	12.75
Carwheels, Chicago	13.25	13.25	13.25	12.00
Carwheels, Philadelphia	13.00	13.00	13.00	10.75
No. 1 cast, Pittsburgh	14.25	14.25	14.25	12.75
No. 1 cast, Philadelphia	13.00	13.00	13.00	11.00
No. 1 cast, Ch'go (net ton)	12.00	12.00	11.75	10.75
No. 1 RR. wrot., Phila.	12.25	12.25	12.25	11.25
No. 1 RR. wrot., Ch'go (net)	11.00	11.00	11.00	11.00

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.65	$3.65	$3.60	$3.85
Foundry coke, prompt	4.25	4.25	4.25	4.60

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, Conn.	**9.25**	9.00	9.00	8.75
Lake copper, New York	9.37½	9.37½	9.37½	9.12½
Tin (Straits), New York	*46.87½*	48.62½	50.25	50.87½
Zinc, East St. Louis	4.85	4.85	4.85	3.75
Zinc, New York	5.22½	5.22½	5.22½	4.10
Lead, St. Louis	4.35	4.35	4.35	3.55
Lead, New York	4.50	4.50	4.50	3.70
Antimony (Asiatic), N. Y.	*13.75*	14.50	14.75	13.87½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
Jan. 7, 1936	2.130c. a Lb.	$18.84 a Gross Ton	$13.33 a Gross Ton
One week ago	2.130c.	18.84	13.33
One month ago	2.130c.	18.84	13.42
One year ago	2.124c.	17.90	12.33

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products represent 85 per cent of the United States output.

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1935	2.130c., Oct. 1	2.124c., Jan. 8	$18.84, Nov. 5	$17.83, May 14	$13.42, Dec. 10	$10.33, April 23
1934	2.199c., April 24	2.008c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	2.015c., Oct. 3	1.867c., April 18	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Pittsburgh Rate Up Four Points to 39 Per Cent

Valley Operations Rise to 62 Per Cent, Wheeling District Average to 72 Per Cent—Scrap Is Strong

PITTSBURGH, Jan. 7.—The local steel industry has shaken loose from retarding holiday influences, and ingot production in the Pittsburgh district has recovered four points this week to 39 per cent of capacity. Small gains are recorded in the Valleys and nearby northern Ohio mills and in the Wheeling district, where production has risen three points to 62 per cent and four points to 72 per cent respectively.

The increased ingot schedules are not predicated for the most part on quickened consumer demand, but are based mainly on some orders for finished steel that accumulated over the holidays. Steel producers here believe it is too early in the month to accurately gage the trend in consumer demand for finished steel. Rolling schedules in January, however, are expected to be sustained by shipment of tonnage entered in December for January shipment. This situation applies in a fair measure to semi-finished steel, sheets, strips and cold-finished bars. The cleaning up of orders for steel on which price advances became effective in fourth quarter will not be completed probably until Jan. 31.

Meanwhile buying at the new prices has not really gotten under way. One of the brightest prospects for increased activity at Pittsburgh is the expanding demand for new rolling equipment, the manufacture of a large part of which probably will center in this district and benefit mills supplying plates and shapes.

Finishing mill schedules are substantially unchanged with sheet and strip operations holding at 65 and 50 per cent respectively. Tin plate output is ten points higher at 70 per cent.

Pig Iron

With only a few exceptions, shipments against low-priced fourth quarter contracts were completed last week. First quarter contracting is getting under way rather slowly, and orders generally are for small quantities. Most users in this district will rely largely upon inventories for early first quarter melt, which has expanded since the holiday recesses. The Sharpsville, Pa., stack has been banked for a short time. All new business is being booked at the higher prices which became nominally effective on Nov. 1.

Semi-Finished Steel

Rerolling billets, slabs, blooms, sheet bars, wire rods and skelp now are nominally established at the advanced levels announced in November. These quotations, however, probably will remain nominal, except for small spot orders, for the better part of January. Most large purchasers of semi-finished materials are taking deliveries against low-priced orders through January. An unusually heavy tin plate operation is forcing a strong flow of sheet bars, which also are benefiting by a high rate of sheet output.

Bars

Consumers have not recovered entirely from irregular holiday schedules and inventory taking, and trend in bar demand consequently is quite indefinite so early in the new year. As soon as fabricating schedules take on more definite shape, bar mills here expect an inflow of orders at least comparable with those of recent weeks. Prospective car building, a large part of which will center in the Pittsburgh area, is a favorable factor in the early outlook. The 1.85c., Pittsburgh, base price seems to be more firmly entrenched, and concessions have narrowed considerably.

Bolts, Nuts and Rivets

December tonnage, which ran well ahead of that for November, reflected a fair protective buying movement in anticipation of higher prices, which became generally effective on Jan. 1 for first quarter. Lacking any current high spots, producers are looking forward to a substantial demand for projected car building programs. Demand for the Pennsylvania cars is expected to materialize in six or eight weeks. It is estimated by producers that at least 30,000 tons will be needed in the construction of the Bessemer & Lake Erie and Union Railroad cars which are now being inquired for.

Reinforcing Steel

Demand for State highway work and the railroad crossing elimination program is about the only sustaining influence in this market. A fairly large quantity of reinforcing bar requirements for Pennsylvania road work is scheduled late this week. The distributers' price for cut lengths of 2.05c., Pittsburgh, while nominally unchanged, continues to suffer concessions on practically all public lettings.

Cold-Finished Bars

The Pittsburgh base price is now established at 2.10c. a lb. for first quarter delivery, with an average reduction of $3 a ton in the chemical compositions of most items. The new price will apply to all spot and contract business entered since the beginning of the month. Most producers, however, accepted specifications until the close of December for shipment during January, and fourth quarter contracts therefore will not be wholly completed until Jan. 31. The trend of demand is fairly steady, with no indications of any early marked change discernible.

Plates and Shapes

The barge market is featured by an inquiry from the Pittsburgh Coal Co. for 10 standard 1000-ton coal barges, riveted or welded type, 175 ft. x 26 ft. x 11 ft., entailing about 1500 tons of plates and shapes. A small quantity of plates will be needed for a derrick boat called for by United States Engineer Office at Vicksburg, Mass. Pittsburgh producers still have not started to roll on material for the Pennsylvania Railroad car building program. Meanwhile other large-sized inquiries for new rolling equipment have bolstered possibilities of an unusually heavy demand for plates and small shapes in the first quarter.

The structural steel market is not unusually brisk. Featuring new inquiries is one for 4400 tons for the Highland Park bridge at Pittsburgh planned by the Allegheny County Authority, which as yet has no funds definitely at its disposal. Several other projects sponsored by that body pend, with awards of steel quite indefinite.

Prices for structural steel remain highly competitive, and fabricators here foresee no substantial improvement until structural steel volume expands well beyond its present proportions. Expansion of

private work, as well as a speeding up of grade crossing elimination projects, is considered an essential supplement to current public works jobs before backlogs are sufficiently heavy to sponsor a firmer attitude on prices.

Tubular Goods

The transition from the old to the new year in this market has been smooth, with shipments proceeding at a fairly regular rate. Volume of orders from the oil fields is steady and is a notable supporting influence in the total movement of pipe. Railroad requirements in small lots are increasing. Orders for mechanical tubing for motor car consumption slipped rather badly during the holiday period. Standard pipe is seasonally depressed, but plans for increased home construction in some areas not affected by cold weather is expected soon to stimulate heavier business. Pending court tests of the public utility bill, expenditures for line pipe are expected to be small and largely for feeder lines.

Wire Products

Demand has receded as a natural aftermath of the year end. Holiday influences and inventory taking have not prompted many consumers to specify their early requirements, but sentiment remains buoyant on the prospect of the beginning of the seasonal movement of merchant wire goods after Jan. 15. Recent takings of manufacturers' wire by the automobile industry reflected diminishing requirements, but to other industrial users shipments have been well sustained. Wire producers are talking with more certainty of a price advance, but when quotations will be marked up is still quite indefinite.

Sheets

Specifications in the past week were somewhat smaller than those in the preceding period, but normally so in view of the season. The falling off was noticeable not only in automotive tonnage but in practically all directions. Whether a substantial pickup from the present level rate of operations materializes soon is a bit problematical. Backlogs are made up substantially of contracts placed in anticipation of expected price advances which failed to occur in fourth quarter and there is some question as to whether buyers will specify fully against these contracts. Hence sheet buying may be a hand-to-mouth affair until consumers are better able to measure their first quarter requirements. Price winds are blowing hot and cold, and at the moment it appears unlikely that any advances would become effective until April 1. Operations in the current week are holding at 65 per cent of capacity.

Tin Plate

Despite an exceptionally heavy carry-over of stocks in mill hands at the outset of 1936, tin plate operations are making a good record in the first week of the year. Production in the current period is estimated at around 70 per cent, with the leading producer scheduled at nearly 80 per cent. A large share of current specifications is for general line can requirements and for sizes not included in present stocks. It is considered questionable, however, whether the entire mill make is being shipped directly to consumers.

Strip Steel

While demand has made a fair recovery since the holidays, it is not on a par with that early in December. It is too early in the new year, according to producers, to analyze consuming trends. At the moment, however, demand from stamping plants and parts makers is by no means vigorous. Hot-rolling operations, on the other hand, are holding at around 50 per cent.

Coal and Coke

Inquiry from England is a feature of this market. In anticipation of possible labor troubles later in January in the Welsh coal fields, firm offers of prices on American bituminous lump, mine-run and slack are being solicited. These grades are plentiful, since tonnages in domestic markets are going begging. An exception is in domestic lump coal, which is enjoying a demand provoked by prolonged inclement weather. Prices of bituminous coal, with the fate of the Guffey act still hanging, are not clearly definable but seem to be displaying more firmness than was apparent early in December. Furnace and foundry coke shipments appear to be still in a holiday slump, with prices nominally unchanged.

Scrap

This market is an enigma, particularly to dealers who are short on orders. Consumers are not showing any eagerness to buy scrap. At the same time, scrap is extremely difficult to pick up, and dealers are paying $14.50 for No. 1 heavy melting steel sold recently at the same price delivered mill. Even at that figure supplies are scarce. Little scrap is moving from the West and Southwest, while virtually no tonnage of importance is coming from the East. The Pittsburgh district seems to be in a pocket, with normal scrap supplies from outside districts being diverted to nearby districts in the Tri-State area. The flow of scrap is further retarded by unfavorable weather conditions affecting preparation at accumulating points. The Pennsylvania Railroad scrap list, which closes on Jan. 8, contains 23,300 tons, including 8000 tons of No. 1 heavy melting steel.

Weekly Indications of Steel Activity

From THE IRON AGE

	Jan. 7, 1936	Dec. 30, 1935	Dec. 10, 1935	Jan. 8, 1935	Average Year to Date 1936	Average Year to Date 1935
Steel ingot operations—Per cent of capacity	51.0	47.5	56.0	44.5	49.6	43.1

	Week Ended Jan. 7, 1936	Dec. 30, 1935	Dec. 10, 1935	Jan. 8, 1935	Year to Date 1936	Year to Date 1935
Fabricated structural steel awards	13,650	20,000	18,000	28,200	13,650	28,200
Fabricated plate awards	12,112	16,235	2,700	6,400	12,112	6,400
Sheet steel piling awards	3,600	0	0	1,400	3,600	1,400
Reinforcing bar awards	2,750	5,600	4,000	4,750	2,750	4,750

Sharp Recovery in Operations In Chicago District

Ingot Rate to Reach 55 Per Cent by End of Week — Revival in Demand Is Unexpectedly Sharp

CHICAGO, Jan. 7.—Ingot output has risen three points to 50 per cent of capacity and, because of the speed with which repair work has been completed at one mill, nine additional open-hearth furnaces will be added before the end of the week, bringing output back to 55 per cent of capacity.

Business is recovering from the holiday setback much faster than is usually the case and all signs point to a mid-January steel volume that will compare favorably with the best that was witnessed in December. Recent sales of finished steel are close to the best week in the year just passed and specifications approach the average for the past few months.

New penstock and pipe business accounts for 5000 tons of plates, a tonnage that is sorely needed by mills. The railroad equipment market still holds promise but nothing concrete has developed in this area so far in the new year. Both automobile and agricultural implement manufacturers look for a better year than in 1935. The death of AAA may cause momentary confusion but there are those close to the farmer who for months have insisted that the Government's program has actually held down prices for many farm products.

Steel mills view last year with satisfaction, since both shipments and sales climbed 45 per cent above the previous year.

Pig Iron

Shipments are moving in substantial volume, and new buying in lots up to 500 tons is gaining. Many melters who have iron on the ground are inclined to hold their inventories as backlogs and to place new orders for at least a part of current requirements. The Zenith furnace, at Duluth, Minn., is now in blast. Shipments in 1935 topped the previous year by 75 per cent and, further, last year's shipments came within 25 per cent of equaling 1930, which the trade considered a good year.

Coke

Prices for January remain unchanged from those established for December shipments. The movement in the final month of the old year exceeded shipments in November, which is rather an unusual performance.

Cast Iron Pipe

Cicero, Ill., is in the market for close to 7000 tons of miscellaneous sizes ranging up to 30 in. in diameter. WPA work, including a number of fair-size sewer and filter projects, forms the backbone of the market. Orders for public work have been reaching sellers in good tonnage, but releases are rather slow. Nevertheless stocks in the hands of pipe manufacturers are shrinking and it is probable that foundry operations will be speeded, especially near the time when winter weather starts to moderate. Prices remain strong.

Reinforcing Bars

This market can boast of only moderate activity, but the future appears bright as viewed through the rose-tinted glasses of Government spending. Plans for sewage and water plants, and schools are numerous. There is also the overhead crossing program, now overdue three to four months. Its surface in the matter of awards has only been scratched. A disturbing development to warehousemen is the fact that much WPA work is being taken by material supply people who heretofore have not dipped into the reinforcing bar field. Prices remain mixed, with no immediate prospect of improvement.

Rails

Demand is inactive but mills are looking for new tonnages before the end of the month. Among these is 35,000 tons for the New York Central. New orders for accessories total 3000 tons. Track supply departments have finished their rush, which was brought about by price changes and heavy orders entered for fourth quarter deliveries. Rail mills are inactive this week but in all probability will resume rolling in the very near future.

Warehouse Business

The first few days of January are proving to be very active, which is contrary to usual expectations. December business, which was almost on a par with November, was about 12 per cent above the last month in 1934. Taken as a whole, 1935 was equal to 1931. Cold-finished steel bars were marked up 15c. a 100 lb. to $3.50, effective Jan. 2.

Plates

Outstanding among inquiries that call for plates is a pipe line for San Diego, Cal., which will take over 3000 tons. Plate demand in the local market is confined to odd and small lots which in the aggregate give very poor support to mills. Railroads are still being pressed for equipment in good repair and shops are well engaged.

Bars

Releases give clear indication that the holiday lull is past, and that it will soon be evident what January is to amount to as a business month. Not all loss of tonnage at Christmas time has been regained, but if the shipment curve continues to climb at the present rate it will be only a matter of a week or two until the January rate will equal, if not exceed, that of mid-December. Agricultural implement manufacturers report 1935 the best year since 1930, and they expect that the new year will top 1935 by at least 25 per cent. Bar shipments to automobile manufacturers in 1935 exceeded the total in the previous year by 45 per cent.

Sheets

All branches of the sheet market are in good condition and much of the holiday loss of shipments has been regained. Both farm implement manufacturers and automobile makers are taking tonnages that compare favorably with those released before the holidays.

Wire Products

This market is recovering from the holiday period and all signs point to a good January, in fact, one far better than usual when taking into account the December volume. Final figures are now available, which show that 1935 shipments topped 1934 by not less than 35 per cent. Mill stocks are fairly well balanced and demand is such that operations are being maintained at 55 per cent of capacity. Jobbers remain quiet but they are still not out of the throes of inventory taking and they are

expected to be heard from in the near future.

Structural Material

Fresh inquiries, at better than 11,000 tons, make a good post-holiday showing, but new awards are light, the aggregate volume being limited to a few thousand tons. The State of Illinois is again going through the motions of taking bids on various bridges and overhead crossings. Bids will be opened Jan. 17 on a long list, most of which consists of readvertised jobs. Shops have fair schedules, but they are looking for additional tonnages which are not in sight at this time.

Scrap

There are very few moves in the scrap market, but those that are being made point to a market which has a good foundation and that could with a little encouragement rise to higher price levels. That such encouragement is at hand is indicated by the fact that mill repairs have been completed ahead of schedule and ingot output is headed for a substantial boost before the end of the week. There is good spot demand for small tonnages, which are more easily handled than those which are frozen in yards. Cold weather and snow are serious handicaps to yard operators. An inkling of the price picture is given by railroad tonnages that are again bringing $13.75 for the heavy melting grade.

Cast Iron Pipe

Boston has awarded 1850 tons to Warren Pipe & Foundry Co.

Milford, Mass., has placed 80 tons with Warren Pipe & Foundry Co.

Westfield, Mass., has placed 1300 ft. of 6 and 8-in. with Warren Pipe & Foundry Co.

Apalachin Water District, Apalachin, N. Y., care of Nussbaum & Clarke, Security Mutual Building, Binghamton, N. Y., consulting engineers, plans pipe lines for water supply; also 25,000-gal. elevated steel tank and tower, and other waterworks equipment. It is planned to ask bids early in spring.

Township Commissioners, Montville, N. J., plans pipe lines for water system and other waterworks installation. Cost about $171,000. Financing has been completed through Federal aid. Clyde Potts, 30 Church Street, New York, is consulting engineer.

Leakesville, Miss., plans pipe lines for water system. Fund of $65,000 has been secured through Federal aid for this and sewer system.

Cicero, Ill., will buy 7000 tons in sizes up to 30-in.

La Crosse, Wis., closed bids Jan. 7 on 6226 ft. of 18-in. for intercepting sewer force main.

Clayton, Kan., plans pipe lines for water system; also other waterworks installation. Fund of $25,000 has been arranged through bond issue and Federal aid.

Storm Lake, Iowa, closes bids Jan. 13 for 11,820 ft. of 6, 8 and 12-in. for water system. George K. McCullough is city engineer.

Covington, Ky., Theodore Kluemper, city manager, asks bids until Feb. 6 for pipe for extensions in water system and replacements of present pipe; also for 75,000-gal. elevated steel tank on 100-ft. tower, pumping machinery and accessories, purification and filtration equipment. Entire project will cost about $800,000. J. S. Watkins, Citizens' Bank Building, Lexington, Ky., is consulting engineer.

Swanton, Neb., closes bids Jan. 16 for pipe lines for water system, divided into two sections: 1120 ft. of 6-in. and 8016 ft. of 4-in. 12-ft. lengths, including 2½ tons cast iron pipe specials (Section 2); 800 ft. of 2-in. (Section 3). Henningson Engineering Co., Union State Bank Building, Omaha, Neb., is consulting engineer.

Fullerton, Cal., plans 4, 6 and 8-in. pipe for water supply in number of streets. Fund of $32,000 has been arranged through Federal aid. Herman Hiltscher is city engineer.

Orange Grove, Tex., plans pipe lines for water system; also elevated steel tank and tower, pumping machinery and other waterworks installation. Fund of $46,000 has been secured through Federal aid. H. R. F. Helland, Frost National Bank Building, San Antonio, Tex., is consulting engineer.

Port Orchard, Wash., has awarded 195 tons to United States Pipe & Foundry Co.

Snohomish, Wash., has awarded 255 tons of 4 to 8-in. to United States Pipe & Foundry Co.

Ridgefield, Wash., has purchased 190 tons from United States Pipe & Foundry Co.

Eatonville, Wash., has awarded 122 tons of 6-in. to United States Pipe & Foundry Co.

Enumclaw, Wash., let 316 tons of 8 to 12-in. to United States Pipe & Foundry Co.

Tacoma, Wash., has opened bids on 100 tons of 6 to 18-in.

Seal Beach, Cal., will open bids Jan. 17 on 197 tons of 8 and 10-in.

Fresno, Cal., has bids under advisement for 275 tons of 6 to 12-in.

Fullerton, Cal., opened bids Jan. 7 on 103 tons of 6 to 12-in.

Atwater, Cal., plans about eight miles of various sizes for water system; also 75,000-gal. elevated steel tank and tower, motor-driven pumping machinery and auxiliary waterworks equipment. Fund of $71,600 is being arranged through bond issue and Federal aid. W. E. Bedesen, 135 Twenty-first Street, Merced, Cal., is consulting engineer.

Reinforcing Steel

Awards 2750 Tons—New Projects 1630 Tons

AWARDS

Hagerstown, Md., 200 tons, sewage development, to Taylor, Davis, Inc.

Kankakee, Ill., 100 tons, State Hospital, to Concrete Engineering Co.

Waukegan, Ill., 130 tons, public school, to Calumet Steel Co.

Chicago, 326 tons, bridge at 147th Street, to Calumet Steel Co.

Aurora, Ill., 176 tons, water storage tank, to Joseph T. Ryerson & Son.

Seattle, 369 tons, Schmitz Park bridge, to Bethlehem Steel Co.

Spokane, Wash., 600 tons, power house, to Truscon Steel Co.

Arlington, Wash., 100 tons, grammar school, to Isaacson Iron Works.

Cheney, Wash., 110 tons, addition to State Normal School, to Truscon Steel Co.

San Leandro, Cal., 150 tons, State undergrade crossing, to Soule Steel Co.

State of California, 169 tons, highway work in four counties, to various bidders.

Denver, 198 tons, flumes on South Boulder diversion conduit, to an unnamed bidder.

Helena, Mont., 121 tons, five water conservation projects, to unnamed bidders.

NEW REINFORCING BAR PROJECTS

New York, 455 tons, State Procurement Division of Treasury; W. Ames & Co., Jersey City, low bidder on 390 tons; Bethlehem Steel Co. low bidder on 15 tons. Bids opened Dec. 30.

Los Angeles, 1280 tons, Macy Street subway for city; bids Feb. 2.

Hamilton County, Ohio, 150 tons bars and 200 tons of wire mesh for highway work; bids taken.

Railroad Equipment

Bessemer & Lake Erie and Union Railroads, subsidiaries of the United States Steel Corpn., are inquiring for 1000 90-ton hopper cars, 1000 70-ton hopper cars, 1000 70-ton mill type gondola cars and 25 road and switching locomotives, for delivery early in 1936. It is understood that cars constructed of high tensile steel will be considered on a competitive basis with cars made of standard material.

Wabash is asking bids until Jan. 10 for improvements and repairs to 300 hopper coal cars, to cost about $303,000.

RAILS AND TRACK SUPPLIES

Sante Fe has placed 47,157 tons of rails with Colorado Fuel & Iron Co., 9000 tons with Carnegie-Illinois Steel Corpn., and 2415 tons with Inland Steel Co. It has also ordered 12,429 tons of rail fastenings from Colorado Fuel & Iron Co., 1496 tons from Carnegie-Illinois Steel Corpn., 1049 tons from Inland Steel Co., 1019 tons from Columbia Steel Co., and 1811 tons from six other producers.

Prices of Finished Steel and Iron Products

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel — *Base per Lb.*

F.o.b. Pittsburgh	1.85c.
F.o.b. Chicago	1.90c.
F.o.b. Gary	1.90c.
F.o.b. Duluth	2.00c.
Del'd Detroit	2.00c.
F.o.b. Cleveland	1.90c.
F.o.b. Buffalo	1.95c.
Del'd Philadelphia	2.16c.
Del'd New York	2.20c.
F.o.b. Birmingham	2.00c.
F.o.b. cars dock Gulf ports	2.25c.
F.o.b. cars Pacific ports	2.40c.

Rail Steel

(For merchant trade)

F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Moline, Ill.	1.75c.
F.o.b. Cleveland	1.75c.
F.o.b. Buffalo	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. cars dock Gulf ports	2.10c.
F.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing

(Straight lengths as quoted by distributors)

F.o.b. Pittsburgh	2.05c.
F.o.b. Chicago	2.10c.
F.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
F.o.b. Cleveland	2.10c.
F.o.b. Youngstown	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. Birmingham	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing

(Straight lengths as quoted by distributors)

F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.30c.

Iron

F.o.b. Chicago	1.80c.
F.o.b. Terre Haute, Ind.	1.75c.
F.o.b. Louisville, Ky.	2.10c.
F.o.b. Danville, Pa.	1.80c.
F.o.b. Berwick, Pa.	1.70c.

Cold Finished Bars and Shafting*

	Base per Lb.
F.o.b. Pittsburgh	2.10c.
F.o.b. Chicago	2.15c.
F.o.b. Gary	2.15c.
F.o.b. Cleveland	2.15c.
F.o.b. Buffalo	2.20c.
Del'd Detroit	2.30c.
Del'd eastern Michigan	2.35c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts

Angle Line Posts

	Base per Net Ton
F.o.b. Pittsburgh	$54.00
F.o.b. Chicago	54.00
F.o.b. Duluth	55.00
F.o.b. Cleveland	54.00
F.o.b. Birmingham	57.00
F.o.b. Houston, Orange, Beaumont, Galveston	63.00
F.o.b. Mobile	62.00
F.o.b. New Orleans, Lake Charles, Corpus Christi	63.00
F.o.b. cars dock Pacific ports	67.00

Plates

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
Del'd Cleveland	1.995c.
F.o.b. Coatesville	1.90c.
F.o.b. Sparrows Point	1.90c.
Del'd Philadelphia	1.99c.
Del'd New York	2.09c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. P'gh	3.20c.

Floor Plates

F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
Del'd Cleveland	1.995c.
F.o.b. Buffalo	1.90c.
F.o.b. Bethlehem	1.90c.
Del'd Philadelphia	2.015c.
Del'd New York	2.0625c.
F.o.b. Birmingham (standard)	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Phila.	2.16c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. cars dock Pacific ports	2.40c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.40c.
No 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.60c.
No. 24, del'd Phila.	2.71c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. cars dock Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, del'd Detroit	2.70c.
No. 10, gage, del'd Phila.	2.81c.
No. 10 gage, f.o.b. Birmingham	2.65c.
No. 10 gage, f.o.b. cars dock Pacific ports	3.10c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Phila.	3.26c.
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 20 f.o.b. cars dock Pacific ports	3.50c.

Galvanized Sheets

No. 24 gage, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Phila.	3.41c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. cars dock Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.40c.
F.o.b. Gary	3.50c.
F.o.b. cars dock Pacific ports	4.10c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	3.10c.
No. 20, f.o.b. Gary	3.20c.
No. 20, f.o.b. Birmingham	3.70c.
No. 20, f.o.b. cars dock Pacific ports	3.70c.
No. 10, f.o.b. Pittsburgh	2.50c.
No. 10, f.o.b. Gary	2.60c.
No. 10, f.o.b. Birmingham	3.10c.
No. 10, f.o.b. cars dock Pacific ports	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock Pacific Coast ports	3.35c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	1.95c.
Cooperage stock, Chicago	2.05c.

Cold-Rolled Strips

	Base per Lb.
F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
Del'd Chicago	2.895c.
F.o.b. Worcester	2.80c.

Fender Stock

No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	*Per Lb.*
Bright wire	2.30c.
Spring wire	2.90c.

Chicago prices on products sold to the manufacturing trade are $1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are $2 a ton above, Birmingham $3 above, and Pacific Coast prices $9 a ton above Pittsburgh or Cleveland.

To the Trade

	Base per Keg
Standard wire nails	$2.40
Smooth coated nails	2.40

	Base per 100 Lb.
Annealed fence wire	$2.45
Galvanized fence wire	2.80
Polished staples	3.10
Galvanized staples	3.35
Barbed Wire galvanized	2.80
Twisted barbless wire	2.80
Woven wire fence, base column	61.00
Single loop bale ties, base column	53.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth, which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi, Tex.; New Orleans, Lake Charles, La., and Mobile, Ala., are $6 a ton over Pittsburgh, while Pacific Coast prices are $8 over Pittsburgh. Exception: on fence wire Pacific Coast price are $11 a ton above Pittsburgh.

On staples and barbed wire, prices of $6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

Wire Hoops, Twisted or Welded

	Off List
F.o.b. Pittsburgh	45 off
F.o.b. Chicago	43½ off

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel Inches	Black	Galv.	*Wrought Iron* Inches	Black	Galv.
⅛	51½	29½	⅛	+91½	+138
¼ to ⅜	53½	35	¼ & ⅜	+1½	+21½
½	58½	47	½	31½	15
¾	62	52	¾	36½	20½
1 to 3	64	55	1&1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	60	51	2	37	22½
2½ to 3	63	54	2½ to 3½	38	25
3½ to 6	65	56	4 to 8	40	28½
7 and 8	64	54	9 to 12	38	24½
9 and 10	63½	53½			
11 and 12	62½	52½			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	51	38	¼ & ⅜	+2½	+34½
½	56½	47½	½	32½	17½
¾	61	52	¾	37½	22½
1 to 3	63	55	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	58	50	2	40	26
2½ to 3	62	54	2½ to 4	45½	33
3½ to 6	65½	57½	4½ to 6	45	33½
7 and 8	64½	54½	7 & 8	46	33
9 and 10	63½	53½	9 to 12	41½	30
11 and 12	62½	52½			

On standard steel pipe an extra 5% off is allowed on sales to consumers while two 5's off apply on sales to jobbers. On less-than-carload shipments prices are determined by adding 20 and 25% and the carload freight rate to the base card. On structural steel pipe the base card is reduced 2 points and two 5's off are allowed to consumers and three 5's off to jobbers.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

		Cold Drawn	Hot Rolled
1 in. o.d.	13 B.W.G.	$ 8.60	$ 7.82
1¼ in. o.d.	13 B.W.G.	10.19	9.26
1½ in. o.d.	13 B.W.G.	11.26	10.23
1¾ in. o.d.	13 B.W.G.	12.81	11.64
2 in. o.d.	13 B.W.G.	14.35	13.04
2¼ in. o.d.	13 B.W.G.	16.00	14.54
2½ in. o.d.	12 B.W.G.	17.61	16.01
2½ in. o.d.	12 B.W.G.	19.29	17.54
2¾ in. o.d.	12 B.W.G.	20.45	18.59
3 in. o.d.	12 B.W.G.	21.45	19.50
4½ in. o.d.	10 B.W.G.	41.08	37.35
3½ in. o.d.	11 B.W.G.	27.09	24.62
4 in. o.d.	10 B.W.G.	33.60	30.54
4½ in. o.d.	10 B.W.G.	41.08	37.35
5 in. o.d.	9 B.W.G.	51.56	46.87
6 in. o.d.	7 B.W.G.	79.15	71.90

Extras for less-carload quantities:

25,000 lb. or ft. to 39,999 lb. or ft.	5 %
12,000 lb. or ft. to 24,999 lb. or ft.	12½ %
6,000 lb. or ft. to 11,999 lb. or ft.	25 %
2,000 lb. or ft. to 5,999 lb. or ft.	35 %
Under 2,000 lb. or ft.	50 %

Lapweld Steel and Knobbled Charcoal Iron Pressure Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

		Steel	*Iron*
1½ in. o.d.	13 B.W.G.	$ 9.72	$20.16
1¾ in. o.d.	13 B.W.G.	11.06	21.84
2 in. o.d.	13 B.W.G.	12.38	17.23
2¼ in. o.d.	13 B.W.G.	13.79	19.58
2½ in. o.d.	12 B.W.G.	16.58	24.19
2¾ in. o.d.	12 W.B.G.	17.54	26.40
3 in. o.d.	12 B.W.G.	18.35	28.39
3¼ in. o.d.	11 B.W.G.	21.56	33.95
3½ in. o.d.	11 B.W.G.	23.15	36.16
4 in. o.d.	10 B.W.G.	28.66	45.36
4½ in. o.d.	10 B.W.G.	35.22	50.48
5 in. o.d.	9 B.W.G.	44.25	61.86
6 in. o.d.	7 B.W.G.	68.14	102.46

Quantity Extras:

40,000 lb. or ft.	base
25,000 lb. or ft. to 39,999 lb. or ft.	plus 5%
10,000 lb. or ft. to 24,999 lb. or ft.	plus 12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	plus 25%
Under 2,000 lb. or ft.	plus 40%

CAST IRON WATER PIPE

	Per Net Ton
*6-in. and larger, del'd Chicago	$48.40
*4-in., del'd Chicago	51.40
6-in. and larger, del'd New York	45.20
4-in., del'd New York	48.20
*6-in. and larger, Birmingham	40.00
*4-in. Birmingham	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	48.00
F.o.b. dock, Seattle	48.50
4-in., f.o.b. dock, San Francisco or Los Angeles	51.00
F.o.b. dock, Seattle	51.50

Class "A" and gas pipe, $3 extra.

* Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $39. Birmingham, and $47.40, delivered Chicago, and 4-in. pipe, $42, Birmingham, and $50.40 a ton, delivered Chicago.

RAILROAD MATERIALS

Rails and Track Supplies

F.o.b. Mill

Standard rails, heavier than 60 lb. per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$35.00
Light rails (from rail steel) per gross ton	34.00

	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.60
Spikes, ½ and smaller	2.60
Tie plates, steel	1.90
Tie plates, Pacific Coast ports	2.00
Track bolts, to steam railroads	3.60
Track bolts, no jobbers, all sizes (per 100 count)	70 per cent off list

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va.

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:
½ in. x 6 in. and smaller..70, 10 and 5
Larger than ½ in. .....70 and 10
Lag bolts .....70 and 10
Plow bolts, Nos. 1, 2, 3 and 7 heads .....70 and 10
Hot-pressed nuts, blank or tapped, square .....70 and 10
Hot-pressed nuts, blank or tapped, hexagon .....70 and 10
C.p.c. and t. square or hex. nuts, blank or tapped .....70 and 10
Semi-finished hexagon nuts, U.S.S. and S.A.E., all sizes to and incl. 1 in. diameter .....60, 20 and 15
Larger than 1 in. diameter..60, 20 and 15
Stove bolts in packages, Pittsburgh 72½ and 10
Stove bolts in packages, Chicago, 72½ and 10
Stove bolts in packages, Cleveland, 72½ and 10
Stove bolts in bulk, Pittsburgh.....82½
Stove bolts in bulk, Chicago.....82½
Stove bolts in bulk, Cleveland.....82½
Tire bolts 55

Large Rivets

(½-in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh or Cleveland.....$2.90
F.o.b. Chicago 3.00
F.o.b. Birmingham 3.05

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh .....70 and 5
F.o.b. Cleveland .....70 and 5
F.o.b. Chicago and Birm'g'm.....70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lbs. on lots of 200 lb. or more)

Per Cent Off List

Milled cap screws, 1 in. dia. and smaller .....80, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller..... 75
Milled headless set screws, cut thread ¾ in. and smaller 75
Upset hex. head cap screws, U.S.S. or S.A.E. thread, 1 in. and smaller.. 85
Upset set screws, cut and oval points .....75 and 10
Milled studs .....65 to 65 and 10

Alloy and Stainless Steel

Alloy Steel Ingots

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Uncropped .....$40 per gross ton

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $49 a gross ton.

Alloy Steel Bars

Price del'd Detroit is $52.
F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base .....2.45c.
Delivered price at Detroit is.....2.60c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (½% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.10c.
6100 Chromium Vanadium Spring Steel	0.70
Chromium Nickel Vanadium	1.40
Carbon Vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo. 2.95c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr. 7 to 9% NI. 0.08 to 0.20% C.)

(Base Prices f.o.b. Pittsburgh)

	Per Lb.
Forging billets	19.55c.
Bars	23c.
Plates	26c.
Structural shapes	23c.
Sheets	33c.
Hot-rolled strip	20¾c.
Cold-rolled strip	27c.
Drawn wire	23c.

Raw and Semi-Finished Steel

Carbon Steel Rerolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped ....$29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Birmingham.
Uncropped .....$31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.

	Per Gross Ton
Rerolling	$29.00
Forging quality	35.00
Delivered Detroit	
Rerolling	$32.00
Forging	38.00
Billets Only F.o.b. Duluth	
Rerolling	$31.00
Forging	37.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton

Open-hearth or Bessemer.....$30.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved ..... 1.80c.
Universal ..... 1.80c.
Sheared ..... 1.80c.

Wire Rods

(Common, base)

	Per Gross Ton
F.o.b. Pittsburgh	$40.00
F.o.b. Cleveland	40.00
F.o.b. Chicago	41.00
F.o.b. Anderson, Ind.	41.00
F.o.b. Youngstown	41.00
F.o.b. Worcester, Mass.	42.00
F.o.b. Birmingham	43.00
F.o.b. San Francisco	49.00
F.o.b. Galveston	46.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$20.50	$21.00	$20.00	$21.50
Bethlehem, Pa.	20.50	21.00	20.00	21.50
Birdsboro, Pa.	20.50	21.00	20.00	21.50
Swedeland, Pa.	20.50	21.00	20.00	21.50
Steelton, Pa.	....	....	20.00	....
Sparrows Point, Md.	20.50	....	20.00	....
Neville Island, Pa.	19.50	19.50	19.00	20.00
Sharpsville, Pa.	19.50	19.50	19.00	20.00
Youngstown	19.50	19.50	19.00	20.00
Buffalo	19.50	20.00	18.50	20.50
Erie, Pa.	19.50	20.00	19.00	20.50
Cleveland	19.50	19.50	19.00	20.00
Toledo, Ohio	19.50	19.50	19.00	20.00
Jackson, Ohio	21.25	21.25	20.75	....
Detroit	19.50	19.50	19.00	20.00
Hamilton, Ohio	19.50	19.50	19.00	20.00
Chicago	19.50	19.50	19.00	20.00
Granite City, Ill.	19.50	19.50	19.00	....
Duluth, Minn.	20.00	20.00	....	20.50
Birmingham	15.50	15.50	14.50	20.00
Provo, Utah	17.50	....	17.00	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass.	$21.00	$21.50	$20.50	$22.00
Brooklyn				
From East. Pa.	22.9289	23.4289	22.4289	23.9289
Newark or Jersey City, N. J.				
From East. Pa.	21.9873	22.4873	21.4873	22.9873
Philadelphia				
From Eastern Pa.	21.3132	21.8132	20.8132	22.3132
Cincinnati				
From Hamilton, Ohio	20.5807	20.5807	20.0807	21.0807
Canton, Ohio				
From Cleveland and Youngstown	20.8402	20.8402	20.3402	21.3402
Columbus, Ohio				
From Hamilton, Ohio	21.64	21.64	....	....
Mansfield, Ohio				
From Cleveland and Toledo	21.3832	21.3832	20.8832	21.8832
Indianapolis				
From Hamilton, Ohio	21.9289	21.9289	....	....
South Bend, Ind.				
From Chicago	21.6935	21.6935	....	....
Milwaukee				
From Chicago	20.57	20.57	....	....
St. Paul				
From Duluth	21.94	....	....	....
Davenport, Iowa				
From Chicago	21.3832	21.3832	....	....
Kansas City				
From Granite City	22.2178	22.2178	....	....
San Francisco, Los Angeles or Seattle. From Provo	22.315	....	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.....$24.00

GRAY FORGE PIG IRON

Valley furnace $19.00
Pittsburgh district furnace 19.00

CHARCOAL PIG IRON

Lake Superior furnace $22.00
Delivered Chicago 25.2528
Delivered Buffalo 25.595

CANADA

Pig Iron

Per gross ton:

Delivered Toronto
No. 1 fdy., sil. 2.25 to 2.75.....$21.00
No. 2 fdy., sil. 1.75 to 2.75..... 20.50
Malleable 22.50

Delivered Montreal
No. 1 fdy., sil. 2.25 to 2.75.....$22.50
No. 2 fdy., sil. 1.75 to 2.25..... 22.00
Malleable 22.50
Basic 22.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $85.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21% $26.00
50-ton lots 3-mo. shipment 24.00
F.o.b. New Orleans 26.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads) $77.50
50% (ton lots) 85.00
75% (carloads) 126.00
75% (ton lots) 136.00

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6.00 to 6.50%	$22.75	12%	$29.25
6.51 to 7.00%	23.25	13%	30.75
7.00 to 7.50%	23.75	14%	32.25
7.51 to 8.00%	24.25	15%	33.75
8.00 to 8.50%	24.75	16%	35.25
8.51 to 9.00%	25.25	17%	36.75
9.00 to 9.50%	25.75		
9.51 to 10.00%	26.25		
10.00 to 10.50%	26.75		
10.51 to 11.00%	27.25		
11.00 to 11.50%	27.75		
11.51 to 12.00%	28.25		

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10.00 to 10.50%	$27.75	13%	$31.75
10.51 to 11.00%	28.25	14%	33.25
11.00 to 11.50%	28.75	15%	34.75
11.51 to 12.00%	29.25	16%	36.25
12%	30.25	17%	37.75

Manganese 2 to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained T. del., carloads $1.30
Ferrotungsten, lots of 5000 lb..... $1.35
Ferrotungsten, smaller lots 1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr. per lb. contained Cr. delivered, in car loads 10.0%c
Ferrochromium, 2% carbon .....16.50c. to 17.00c.
Ferrochromium, 1% carbon .....17.50c. to 18.00c.
Ferrochromium, 0.10% carbon .....19.50c. to 20.00
Ferrochromium, 0.06% carbon .....20.00c. to 20.50c.
Ferrovanadium, del. per lb. contained V. .....$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C. f.o.b. furnace carload and contract per net ton..$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50
Ferrophosphorus, electric, 24%, in carlots, f.o.b. Anniston, Ala., per gross ton with $3 unitage, freight equalized with Nashville, Tenn. 75.00
Ferromolybdenum, per lb. Mo., del. 95c.
Calcium molybdate, per lb. Mo., del. ..... 80c.
Silico spiegel, per ton, f.o.b. furnace, carloads $38.00
Ton lots or less, per ton..... 45.50
Silico-manganese, gross ton, delivered.
2.50% carbon grade 90.00
2% carbon grade 95.00
1% carbon grade 105.00
Spot prices .....$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$14.00 to $14.50
No. 2 heavy melting steel	12.50 to 13.00
No. 2 railroad wrought	14.25 to 14.75
Scrap rails	14.50 to 15.00
Rails, 3 ft. and under	15.50 to 16.00
Compressed sheet steel	14.00 to 14.50
Hand bundled sheet steel	12.50 to 13.00
Hvy. steel axle turnings	12.50 to 13.00
Machine shop turnings	9.75 to 10.25
Short shov. turnings	9.75 to 10.25
Short mixed borings and turnings	8.50 to 9.50
Cast iron borings	8.50 to 9.50
Cast iron carwheels	14.00 to 14.50
Heavy breakable cast	12.50 to 13.00
No. 1 cast	14.00 to 14.50
Railr. knuckles and couplers	15.75 to 16.25
Rail. coil and leaf springs	15.75 to 16.25
Rolled steel wheels	15.75 to 16.25
Low phos. billet crops	16.50 to 17.00
Low phos. sheet bar crops	16.00 to 16.50
Low phos. punchings	15.75 to 16.25
Low phos. plate scrap	15.25 to 15.75
Steel car axles	15.00 to 15.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$13.00 to $13.50
Automobile hvy. melt steel	11.50 to 12.00
Shoveling steel	13.00 to 13.50
Hydraulic comp. sheets	12.25 to 12.75
Drop forge flashings	10.75 to 11.25
No. 1 busheling	11.75 to 12.25
Rolled carwheels	14.00 to 14.50
Railroad tires	14.00 to 14.50
Railroad leaf springs	14.00 to 14.50
Axle turnings	12.50 to 13.00
Steel couplers and knuckles	14.00 to 14.50
Coil springs	15.00 to 15.50
Axle turnings (elec. fur.)	13.25 to 13.75
Low phos. punchings	14.50 to 15.00
Low phos. plates, 12 in. and under	14.50 to 15.00
Cast iron borings	6.00 to 6.50
Short shoveling turnings	7.00 to 7.50
Machine shop turnings	6.50 to 7.00
Rerolling rails	14.00 to 14.50
Steel rails, less than 3 ft.	14.50 to 15.00
Steel rails, less than 2 ft.	15.50 to 16.00
Angle bars, steel	14.50 to 15.00
Cast iron carwheels	13.25 to 13.75
Railroad malleable	15.75 to 16.25
Agricultural malleable	14.50 to 15.00

	Per Net Ton
Iron car axles	$16.00 to $16.50
Steel car axles	14.00 to 14.50
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	11.75 to 12.25
No. 2 busheling, old	6.50 to 7.00
Locomotive tires, smooth	12.00 to 12.50
Pipes and flues	7.00 to 7.50
No. 1 machinery cast	12.00 to 12.50
Clean automobile cast	11.00 to 11.50
No. 1 railroad cast	10.75 to 11.25
No. 1 agricultural cast	10.25 to 10.75
Stove plate	7.00 to 7.50
Grate bars	8.50 to 9.00
Brake shoes	9.00 to 9.50

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$12.50
No. 2 heavy melting steel	$11.00 to 11.50
Hydraulic compressed, new	11.50 to 12.00
Hydraulic compressed, old	8.50 to 9.00
Steel rails for rolling	14.00 to 14.50
Cast iron carwheels	13.00 to 13.50
Heavy breakable cast	12.00
No. 1 cast	13.00 to 13.50
Stove plate (steel works)	9.50 to 10.00
Railroad malleable	14.50 to 15.00
Machine shop turnings	7.50 to 8.00
No. 1 blast furnace	6.25
Cast borings	6.00
Heavy axle turnings	9.50 to 10.00
No. 1 low phos. heavy	15.00 to 16.00
Couplers and knuckles	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Steel axles	16.00 to 16.50
Shafting	18.00 to 18.50
No. 1 railroad wrought	12.00 to 12.50
Spec. iron and steel pipe	9.75 to 10.25
Bundled sheets	10.50 to 11.00
No. 1 forge fire	10.50 to 11.00
Cast borings (chem.)	10.50 to 13.00

CINCINNATI

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$10.50 to $11.00
No. 2 heavy melting steel	8.50 to 9.00
Scrap rails for melting	9.75 to 10.25
Loose sheet clippings	6.50 to 7.00
Bundled sheets	7.75 to 8.25
Cast iron borings	6.00 to 6.50
Machine shop turnings	6.25 to 6.75
No. 1 busheling	7.75 to 8.25
No. 2 busheling	4.25 to 4.75
Rails for rolling	10.75 to 11.25
No. 1 locomotive tires	9.00 to 9.50
Short rails	13.50 to 14.00
Cast iron carwheels	10.00 to 10.50
No. 1 machinery cast	11.00 to 11.50
No. 1 railroad cast	10.25 to 10.75
Burnt cast	7.75 to 8.25
Stove plate	7.75 to 8.25
Agricultural malleable	9.75 to 10.25
Railroad malleable	11.00 to 11.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$12.75 to $13.25
No. 2 heavy melting steel	11.75 to 12.25
Compressed sheet steel	12.25 to 12.75
Light bundled sheet stampings	9.25 to 9.75
Drop forge flashings	11.75 to 12.25
Machine shop turnings	7.50 to 8.00
Short shoveling turnings	8.50 to 9.00
No. 1 busheling	11.50 to 12.00
Steel axle turnings	10.75 to 11.25
Low phos. billet crops	16.00 to 16.50
Cast iron borings	8.50 to 9.00
Mixed borings and short turnings	8.50 to 9.00
No. 2 busheling	8.50 to 9.00
No. 1 cast	13.50 to 14.00
Railroad grate bars	7.00 to 7.50
Stove plate	7.50 to 8.00
Rails under 3 ft.	15.50 to 16.00
Rails for rolling	15.50 to 16.00
Railroad malleable	16.50 to 17.00
Cast iron carwheels	12.75 to 13.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$12.00 to $12.50
No. 2 heavy melting scrap	11.00 to 11.50
Scrap rails	12.00 to 12.50
New hydraul. comp. sheets	11.00 to 11.50
Old hydraul. comp. sheets	9.00 to 9.50
Drop forge flashings	11.00 to 11.50
No. 1 busheling	11.00 to 11.50
Hvy. steel axle turnings	10.50 to 11.00
Machine shop turnings	6.50 to 7.00
Knuckles and couplers	13.00 to 14.00
Coil and leaf springs	13.00 to 14.00
Rolled steel wheels	13.00 to 14.00
Low phos. billet crops	14.50 to 15.00
Short shov. steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
No. 2 busheling	7.00 to 7.50
Steel car axles	12.50 to 13.00
Iron axles	12.50 to 13.00
No. 1 machinery cast	12.50 to 13.00
No. 1 cupola cast	11.50 to 12.00
Stove plate	10.00 to 10.50
Steel rails, 3 ft. and under	14.50 to 15.00
Cast iron carwheels	12.00 to 12.50
Railroad malleable	15.00 to 15.50
Chemical borings	9.00 to 9.50

BOSTON

Dealers' buying prices per gross ton:

*No. 1 heavy melting steel	$10.00
No. 1 heavy melting steel	$7.40 to 7.90
*Scrap rails	9.75 to 10.00
*No. 2 steel	9.00
No. 2 steel	6.40 to 6.90
Breakable cast	6.75 to 7.00
Machine shop turnings	3.65 to 3.90
*Machine shop turnings	5.25 to 5.50
Bundled skeleton, long	6.75 to 6.90
Forge flashings	6.00 to 6.25
Shafting	13.00 to 13.25
Steel car axles	12.50 to 13.00
Cast iron borings, chemical	5.00 to 7.00
*No. 1 textile cast	9.10 to 9.25
*Stove plate	6.75 to 7.00

Per gross ton delivered consumers' yards:

Textile cast	9.75 to 10.00
No. 1 machinery cast	9.25 to 9.50
Stove plate	6.00 to 6.50
Railroad malleable	11.00 to 11.50

* Delivered local army base.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$8.50 to *†9.00
No. 2 heavy melting steel	7.50 to *†8.00
Heavy breakable cast	7.00 to 7.50
No. 1 machinery cast	8.00 to 8.50
No. 2 cast	†7.50
Stove plate	†6.75
Steel car axles	13.50 to 14.00
Shafting	13.50 to 13.75
No. 1 railroad wrought	8.50 to 9.00
No. 1 yard wrought long	7.50 to 8.00
Spec. iron and steel pipe	6.00 to 6.50
Forge fire	6.50 to 7.00
Rails for rolling	9.00 to 10.00
Short shoveling turnings	3.50 to 4.00
Machine shop turnings	3.50 to 4.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	10.00 to 11.00
Unprepared yard iron and steel	4.50 to 5.00

Per gross ton, delivered local foundries:

No. 1 machinery cast	$11.00
No. 1 hvy. cast (cupola size)	9.50
No. 2 cast	8.00

† Loading on barge.
*50c. higher offered at nearby New Jersey points.

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$9.50 to $10.00
Scrap steel rails	11.00 to 11.50
Short shoveling turnings	7.00
Stove plates	7.00
Steel axles	11.50 to 12.00
Iron axles	11.50
No. 1 railroad wrought	8.50
Rails for rolling	12.50
No. 1 cast	10.50 to 11.00
Tramcar wheels	10.00 to 10.50

ST. LOUIS

Dealers' buying prices per gross ton delivered consumers' works:

Selected heavy steel	$11.00 to $11.50
No. 1 heavy melting	10.75 to 11.25
No. 2 heavy melting	9.00 to 9.50
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	11.50 to 12.00
Railroad springs	12.00 to 12.50
Bundled sheets	7.50 to 8.00
No. 2 railroad wrought	10.50 to 11.00
No. 1 busheling	6.50 to 7.00
Cast iron borings and shoveling turnings	3.00 to 3.50
Rails for rolling	12.50 to 13.00
Machine shop turnings	2.75 to 3.25
Heavy turnings	8.00 to 8.50
Steel car axles	12.50 to 13.00
Iron car axles	15.00 to 16.00
No. 1 railroad wrought	8.50 to 9.00
Steel rails less than 3 ft.	13.00 to 13.50
Steel angle bars	12.50 to 13.00
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	11.25 to 11.50
Railroad malleable	13.25 to 13.75
No. 1 railroad cast	10.00 to 10.50
Stove plate	7.50 to 8.00
Agricult. malleable	11.75 to 12.25

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$9.75 to $10.25
Borings and short turnings	$5.50 to $6.00
Long turnings	5.50 to 6.00
No. 1 machinery cast	13.00 to 13.50
Automotive cast	13.00 to 13.50
Hydraulic comp. sheets	10.25 to 10.75
Stove plate	7.75 to 8.25
New factory busheling	9.50 to 10.00
Old No. 2 busheling	5.25 to 5.75
Sheet clippings	7.25 to 7.75
Flashings	9.00 to 9.50
Low phos. plate scrap	10.50 to 11.00

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$8.00	$7.50
Rails, scrap	8.50	8.00
Machine shop turnings	3.50	3.50
Boiler plate	5.00	5.00
Heavy axle turnings	4.50	4.00
Cast borings	4.50	4.00
Steel borings	3.00	3.00
Wrought pipe	4.00	4.00
Steel axles	8.00	8.50
Axles, wrought iron	8.00	8.50
No. 1 machinery cast	9.50	9.00
Stove plae	6.50	6.00
Standard carwheels	7.75	7.00
Malleable	7.50	7.00

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.50% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer 51.50% iron	4.65
Messabi, non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron dry Spanish or Algeria	10.25c.
Iron, low phos., Swedish, average 68½% iron	10.25c.
Iron, basic or foundry, Swedish, aver. 65% iron	9.50c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Manganese, Caucasian, washed 52%	26c.
Manganese, African, Indian, 44-48%	25c.
Manganese, African, Indian, 49-51%	26c.
Manganese, Brazilian, 46 to 48½%	24c.

	Per Net Ton Unit
Tungsten, Chinese, wolframite, duty paid, delivered	$15.75 to $16.00
Tungsten, domestic, scheelite delivered	15.75 to 16.00

	Per Gross Ton
Chrome, 45% Cr_2O_3, lump, c.i.f. Atlantic Seaboard (African)	$17.50
45 to 46% Cr_2O_3 (Turkish)	$16.50 to $17.00
48% Cr_2O_3 (African)	20.50
48% min. Cr_2O_3 (Turkish)	19.25
Chrome concentrate, 50% and over Cr_2O_3, c.i.f. Atlantic Seaboard	22.00
52% Cr_2O_3 (Turkish)	21.75
48 to 49% Cr_2O_3 (Turkish)	19.25

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines for all rail shipment	$16.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	17.50
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	18.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	20.00
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$3.65 to $3.80
Foundry, f.o.b. Connellsville Prompt	4.25 to 5.75
Foundry, by-product, Chicago ovens, for delivery outside switching district	9.00
Foundry, by-product, delivery in Chicago switching district	9.75
Foundry, by-product, New England, delivered	11.50
Foundry, by-product, Newark or Jersey City, del'd	9.24 to 9.72
Foundry, by-product, Phila.	9.03
Foundry, by-product, Clevelanda, delivered	9.75
Foundry, Birmingham	6.00
Foundry, by-product, St. Louis f.o.b. ovens	$8.00
Foundry, by-product, del'd St. Louis	9.00
Foundry, from Birmingham, f.o.b. cars docks, Pacific ports	14.75

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.50 to $1.75
Mine run coking coal, f.o.b. W. Pa.	1.90 to 2.10
Gas coal, ¾-in. f.o.b. Pa. mines	2.00 to 2.25
Mine run gas coal, f.o.b. Pa. mines	1.80 to 2.00
Steam slack, f.o.b. W. Pa. mines	0.90 to 1.15
Gas slack, f.o.b. W. Pa. mines	1.20 to 1.45

Fuel Oil

	Per Gal. f.o.b. Bayonne, N. J.
No. 3 distillate	4.25c.
No. 4 industrial	3.87½c.

	Per Gal. f.o.b. Baltimore
No. 3 distillate	4.25c.
No. 4 industrial	3.87½c.

	Per Gal. del'd Chicago
No. 3 industrial fuel oil	4.75c.
No. 5 industrial fuel oil	3.75c.

	Per Gal. f.o.b. Cleveland
No. 3 distillate	5.50c.
No. 4 industrial	5.25c.
No. 5 industrial	4.00c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	50.00	43.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago District	54.00
Birmingham	55.00
Silica clay, per net ton	8.00

Chrome Brick

	Per Net Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	$45.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	45.00

Magnesite Brick

	Per Net Ton
Standard, f.o.b. Baltimore and Chester, Pa.	$65.00
Chemically bonded, f.o.b. Baltimore	55.00

Grain Magnesite

	Per Net Ton
Imported, f.o.b. Baltimore and Chester, Pa.	$45.00
Domestic, f.o.b. Baltimore and Chester	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

Warehouse Prices for Steel Products

PITTSBURGH

Base per Lb.

Plates	3.15c.
Structural shapes	3.15c.
Soft steel bars and small shapes	2.95c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock:	
Rounds and hexagons	3.35c.
Squares and flats	3.35c.
Hoops and bands under ¼ in.	3.20c.
Hot-rolled anealed sheets (No. 24), 25 or more bundles	3.30c.
Galv. sheets (No. 24), 25 or more bundles	3.95c.
Hot-rolled sheets (No. 10)	2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.69
Spikes, large	2.90c.

Track bolts, all sizes, per 100 count, 65 per cent off list.

Machine bolts, 100 count, 65 per cent off list.

Carriage bolts, 100 count, 65 per cent off list.

Nuts, all styles, 100 count, 65 per cent off list.

Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb	*2.70
Wire, galv. soft, base per 100 lb.	*2.925
Common wire nails, per keg	*2.834
Cement coated nails, per keg	*2.834

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 9999 lbs.

*Delivered in Pittsburgh switching district.

CHICAGO

Base per Lb.

Plates and structural shapes	3.20c.
Soft steel bars, rounds	3.00c.
Soft steel bars, squares and hexagons	3.15c.
Cold-fin. steel bars:	
Rounds and hexagons	3.50c.
Flats and squares	3.50c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (keg lots)	3.50c.
Track bolts (keg lots)	4.65c.
Rivets, structural (keg lots)	3.65c.
Rivets, boiler (keg lots)	3.75c.

Per Cent Off List

Machine bolts	*70
Carriage bolts	*70
Lag screws	*70
Hot-pressed nuts, sq. tap. or	
Hot-pressed nuts, sq. tap or blank	*70
Hot-pressed nuts, hex. tap or	
Hot-pressed nuts, hex. tap or blank	*70
Hex. head cap screws	87½
Cut point set screws	80
Flat head bright wood screws	50 and 20
Spring cotters	55
Stove bolts in full packages	70
Rd. hd. tank rivets, 7/16 in. and smaller	57½
Wrought washers	$4.50 off list
Black ann'l'd wire per 100 lb.	$3.85
Com. wire nails, base per keg	2.95†
Cement c't'd nails, base per keg	2.95†

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.

*These are quotations delivered to city trade for quantities of 100 lb. or more. For lots of less than 100 lb., the quotation is 65 per cent off. Discounts applying to country trade are 70 per cent off, f.o.b. Chicago, with full or partial freight allowed up to 50c. per 100 lb.

†Prices for city and suburbs only.

NEW YORK

Base per Lb.

Plates, ¼ in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, rounds	3.31c.
Iron bars	3.31c.
Iron bars, swed. charcoal	6.75c. to 7.00c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.81c.
Flats and squares	3.81c.
Cold-rolled; strip, soft and quarter hard	3.36c.
Hoops	3.56c.
Bands	3.56c.
Hot-rolled sheets (No. 10)	3.31c.
Hot-rolled ann'l'd sheets (No. 24*)	3.89c.
Galvanized sheets (No. 24*)	special
Long terne sheets (No. 24)	5.25c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.40c.
Wire, galv. (No. 10)	3.75c.
Tire steel, 1 x ½ in. and larger	3.75c.
Open hearth spring steel	4.00c. to 10.00c.
Common wire nails, base, per keg	$3.21

Per Cent Off List

Machine bolts, square head and nut:	
All diameters	70 and 10
Carriage bolts, cut thread:	
All diameters	65 and 10

Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes	3.45c.
Bars, soft steel (rounds and flats)	3.25c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.40c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Hot-rolled annealed sheets (No. 24)	4.10c.
Galv. sheets (No. 24)	4.65c.
Hot-rolled sheets (No. 10)	3.30c.
Black corrug. sheets (No. 24)	4.10c.
*Galv. corrug. sheets	4.65c.
Structural rivets	4.00c.
Boiler rivets	4.10c.

Per Cent Off List

Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts:	
All quantities	70

*No. 26 and lighter take special prices.

PHILADELPHIA

Base per Lb.

*Plates, ¼-in. and heavier	2.98c.
*Structural shapes	2.98c.
*Soft steel bars, small shapes, iron bars (except bands)	3.03c.
‡Reinforc. steel bars, sq. twisted and deformed	2.96c.
Cold-finished steel bars	3.76c.
*Steel hoops	3.43c.
*Steel bands, No. 12 and 3/16 in. incl.	3.18c.
Spring steel	5.00c.
†Hot-rolled aneal. sheets (No. 24)	3.65c.
†Galvanized sheets (No. 24)	4.40c.
*Hot-rolled annealed sheets (No. 10)	3.08c.
Diam. pat. floor plates, ¼ in.	4.95c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For less than 2000 lb.

CLEVELAND

Base per Lb.

Plates and struc. shapes	3.31c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.10c.
†Cold-finished steel bars	3.50c.
Flat-rolled steel under ¼ in.	3.36c.
Cold-finished strip	†3.00c.
Hot-rolled annealed sheets (No. 24)	3.91c.
Galvanized sheets (No. 24)	4.61c.
Hot-rolled sheets (No. 10)	3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.56c.
*Black ann'l'd wire, per 100 lb.	$2.75
*No. 9 galv. wire, per 100 lb.	3.10
*Com. wire nails, base per keg	2.70

†Outside delivery 10c. less.

*For 5000 lb. or less.

CINCINNATI

Base per Lb.

Plates and struc. shapes	3.42c.
Bars, rounds, flats and angles	3.22c.
Other shapes	3.37c.
Rail steel reinfore. bars	3.25c.
Hoops and bands, 3/16 in. and lighter	3.47c.
Cold-finished bars	3.57c.
Hot-rolled annealed sheets (No. 24)	4.02c.
Galv. sheets (No. 24)	4.72c.
Hot-rolled sheets (No. 10)	3.22c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over)	$2.88
Com. wire nails, base per keg:	
Any quantity less than carload	3.04
Cement c't'd nails, base 100-lb. keg	3.50
Chain, 1in. per 100 lb.	8.35

Net per 100 Ft.

Seamless steel boiler tubes, 2-in.	$20.37
4-in.	48.14
Lap-welded steel boiler tubes, 2-in.	19.38
4-in.	45.32

BUFFALO

Base per Lb.

Plates	3.38c.
Struc. shapes	3.25c.
Soft steel bars	3.05c.
Reinforcing bars	2.60c.
Cold-fin. flats and sq.	3.55c.
Rounds and hex.	3.55c.
Cold-rolled strip steel	3.19c.
Hot-rolled annealed sheets (No. 24)	4.06c.
Heavy hot-rolled sheets (3/16 in., 24 to 48 in. wide)	3.63c.
Galv. sheets (No. 24)	4.70c.
Bands	3.43c.
Hoops	3.43c.
Heavy hot-rolled sheets	3.18c.
Com. wire nails, base per keg	$3.35
Black wire, base per 100 lb. (2500-lb. lots or under)	3.55
(Over 2500 lb.)	3.45

BOSTON

Base per Lb.

Beams, channels, angles, tees, zees	3.54c.
H beams and shapes	3.54c.
Plates—Sheered, tank and univ. mill, ¼ in. thick and heavier	3.56c.
Floor plates, diamond pattern	5.36c.
Bar and bar shapes (mild steel)	3.45c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.65c. to 4.65c.
Half rounds, half ovals, ovals and bevels	4.70c.
Tire steel	4.70c.
Cold-rolled strip steel	3.245c.
Cold-finished rounds, squares and hexagons	3.90c.
Cold-finished flats	3.90c.
Blue annealed sheets, No. 10 ga.	3.65c.
One pass cold-rolled sheets No. 24 ga.	4.20c.
Galvanized steel sheets, No. 24 ga.	4.90c.
Lead coated sheets, No. 24 ga.	5.85c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

DETROIT

Base per Lb.

Soft steel bars	3.09c
Structural shapes	3.42c.
Plates	3.42c.
Floor plates	5.17c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Hot-rolled sheets (No. 10)	3.14c.
Galvanized sheets (No. 24)	4.72c.
Bands	3.39c.
Hoops	3.39c.
†Cold-finished bars	3.64c.
Cold-rolled strip	3.18c.
Hot-rolled alloy steel (S.A.E. 3100 Series)	5.29c.*
Bolts and nuts	70 and 10 per cent off list

Prices delivered by truck in metropolitan Detroit, subject to quantity differentials.

*Price apolies to 1,000 lb. and over.

†With reduction in chemical extras.

MILWAUKEE

Base per Lb.

Plates and structural shapes	3.31c.
Soft steel bars, rounds up to 8 in., flats and fillet angles	3.11c.
Soft steel bars, squares and hexagons	3.26c.
Hot-rolled strip	3.41c.
Hot-rolled sheets (No. 10)	3.16c.
Hot-rolled annealed sheets (No. 24)	3.96c.
Galvanized sheets (No. 20)	4.66c.
Cold-finished steel bars	3.46c.
Cold-rolled strip	3.33c.
Structural rivets (keg lots)	3.86c.
Boiler rivets, cone head (keg lots)	3.96c.
Track spikes (keg lots)	3.71c.
Track bolts (keg lots)	4.86c.
Black annealed wire	3.25c.
Com. wire nails	2.95c.
Cement coated nails	2.95c.

Per Cent Off List

Machine bolts	70 and 10
Carriage bolts	70 and 10
Hot-pressed nuts, sq. and hex. tapped or blank (keg lots)	70 and 10

Prices given above are delivered Milwaukee.

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. On galvanized and No. 24 hot-rolled annealed sheets the prices given apply on orders of 400 to 1500 lb. On cold-finished bars the prices are for orders of 1000 lb. or more of a size.

ST. PAUL

Base per Lb.

Mild steel bars, rounds	3.25c.
Structural shapes	3.45c.
Plates	3.45c.
Cold-finished bars	3.87c.
Bands and hoops	3.55c.
Hot-rolled annealed sheets, No. 24	3.90c.
Galvanized sheets, No. 24	4.50c.
Cold-rolled sheets, No. 20	4.95c.

On mild steel bars, shapes, plates and hoops and bands the base applies on 400 to 14,999 lb. On cold-finished bars, hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over.

BALTIMORE

Base per Lb.

*Mild steel bars	3.00c.
*Reinforcing bars	2.85c.
*Structural shapes	3.00c.
†Plates	3.00c.
†Hot-rolled sheets, No. 10	3.10c.
‡Hot-rolled annealed sheets, No. 24	3.60c.
‡Galvanized sheets, No. 24	4.30c.
*Bands	3.20c.
*Hoops	3.45c.
§Cold-rolled rounds	3.58c.
§Cold-rolled squares, hex. and flats	3.58c.
Rivets	4.40c.
Bolts and nuts, per cent off list	60 and 10

*Quantity extras per size apply. †Quantity extras per thickness apply. Hot-rolled quantity extras are: 2000 lb. and over, base; 1500 lb. to 1999 lb. add 15c. per 100 lb.; 1000 lb. to 1499 lb., add 30c., 0 to 999 lb., add 50c.

225 bundles and over, base. For 1 to 9 bundles add 50c. per 100 lb.; for 10 to 24 bundles add 25c.

§Base for 1000 lb. and over. For 500 to 999 lb. add 25c. per 100 lb.; for 300 to 499 lb. add $1.00; for 0 to 299 lb. add $1.75; for combined order under 100 lb. add $3.00.

CHATTANOOGA

Base per Lb

Mild steel bars	3.36c.
Iron bars	3.36c.
Reinforcing bars	3.36c.
Structural shapes	3.56c.
Plates	3.56c.
Hot-rolled sheets, No. 10	3.36c.
Hot-rolled annealed sheets, No. 24	4.16c.
Galvanized sheets, No. 24	4.86c.
Steel bands	3.61c.
Cold-finished bars	3.98c.

MEMPHIS

Base per Lb.

Mild steel bars	3.47c.
Shapes, bar size	3.47c.
Iron bars	3.47c.
Structural shapes	3.67c.
Plates	3.67c.
Hot-rolled sheets, No. 10	3.47c.
Hot-rolled annealed sheets, No. 24	4.27c.
Galvanized sheets, No. 24	4.89c.
Steel bands	3.72c.
Cold-drawn rounds	3.89c.
Cold-drawn flats, squares, hexagons	5.89c.
Structural rivets	4.25c.
Bolts and nuts, per cent off list	65
Small rivets, per cent off list	50

NEW ORLEANS

Base per Lb

Mild steel bars	3.35c.
Reinforcing bars	3.50c.
Structural shapes	3.55c.
Plates	3.55c.
Hot-rolled sheets, No. 10	3.55c.
Hot-rolled annealed sheets, No. 24	4.50c.
Galvanized sheets, No. 24	4.95c.
Steel bands	3.95c.
Cold-finished steel bars	4.30c.
Structural rivets	4.25c.
Boiler rivets	4.25c.
Common wire nails, base per keg	$2.95
Bolts and nuts, per cent off list	70

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.50c.	3.60c.	3.55c.
Shapes, standard	3.50c.	3.60c.	3.55c.
Soft steel bars	3.50c.	3.60c.	3.70c.
Reinforcing bars, f.o.b. cars dock Pacific ports	2.45c.	2.45c.	2.45c.
Hot-rolled annealed sheets (No. 24)	4.25c.	4.35c.	4.40c.
Hot-rolled sheets (No. 10)	3.60c.	3.70c.	3.75c.
Galv. sheets (No. 24)	5.00c.	4.95c.	5.00c.
Cold finished steel Rounds	5.80c.	5.85c.	6.00c
Squares and hexagons	7.05c.	7.10c.	7.25c.
Flats	7.55c.	7.60c.	8.25c.
Common wire nails —base per keg	$3.20	$3.20	$3.20
less carload			

All items subject to differentials for quantity.

TOOL STEEL

Prices are same for warehouse distribution at all points on or East of Mississippi River. West of Mississippi quotations are 1c. a lb. higher.

Base per Lb.

High speed	57c.
High carbon chrome	37c.
Oil hardening	22c.
Extra	17c.
Regular	14c.

Cleveland Output Up Nine Points to 61 Per Cent

Sheet and Strip Mills Operate Full —Demand for Price Concession on Sheets Widens—Scrap Stronger

CLEVELAND, Jan. 7.—New demand for finished steel has partially recovered from the slowing down during the holiday period. Ingot output in the Cleveland-Lorain district increased nine points to 61 per cent of capacity this week. The higher rate was established by the resumption of one open-hearth plant that was shut down until after New Year's. This rate compares with 82 per cent operations the week before Christmas.

Republic Steel Corpn. has blown out a blast furnace in Cleveland.

With a good backlog from the motor car industry, the local sheet and strip mills continue in full operation. In view of the belief that consumers' inventories are low, steel makers look for a good volume of miscellaneous business through January. Automobile manufacturers are again coming into the market and are expected to make large purchases shortly. Some may cover for February and March requirements instead of only for one month. New orders for substantial tonnages of strip steel have come from automobile parts plants.

Mills are loaded up with specifications for semi-finished steel placed at the end of December before the price advance, and some will be unable to ship all this steel before the deadline date of Jan. 15. It may be several weeks before these is a real test of the advanced prices, against which there is considerable resistance.

The sheet market has become greatly disturbed by the recent $3 a ton price concession in the Detroit territory. Spurred by automobile manufacturers, stamping plants making motor car parts are insisting that they be granted the same concession and there are reports of weakening in some cases. Stampers also claim they are entitled to the same concession on sheets for other uses. Much of the large tonnage of sheet steel used by refrigerator manufacturers is cold-rolled material, the same grade as goes in automobiles, and refrigerator manufacturers want the same price concession.

An advance in mill quantity extras on small lots of stainless steel is being considered with a view of diverting more of this business to jobbers.

Blast furnace scrap has advanced $1 a ton.

Pig Iron

While some foundries have taken in good stocks, inventories generally are not large and the melt is holding up well. This encourages the belief among producers that a fair volume of new business will come out in the latter part of January to replenish their present rather light order books. Nearly all the iron purchased before the $1 a ton price advance became effective was shipped before Jan. 1. However, in some cases furnaces were unable to deliver all the iron ordered in December and this will be shipped this month. December shipments by one Lake merchant furnace interest were the largest since April, 1930.

Sheets

Large purchases by some of the automobile manufacturers are expected in the next week or two, and some of the motor car builders who have been purchasing only for 30 days' requirements are considering placing orders covering both February and March deliveries or through the remainder of the quarter. Possibly the recent price concession in the Detroit territory is an incentive for purchases for more extended deliveries than recently. While demand in the Cleveland territory is fair, the pressure for deliveries that was in evidence before the holidays is no longer apparent. Some business is coming from refrigerator manufacturers, although these have not yet got under large production on new models. The local sheet mills are operating this week at full capacity.

Strip Steel

New large-lot purchases were made during the week by General Motors parts plants for February requirements, and new releases against old orders also came from these plants. Local stamping plants doing automotive work are crowding mills for deliveries of

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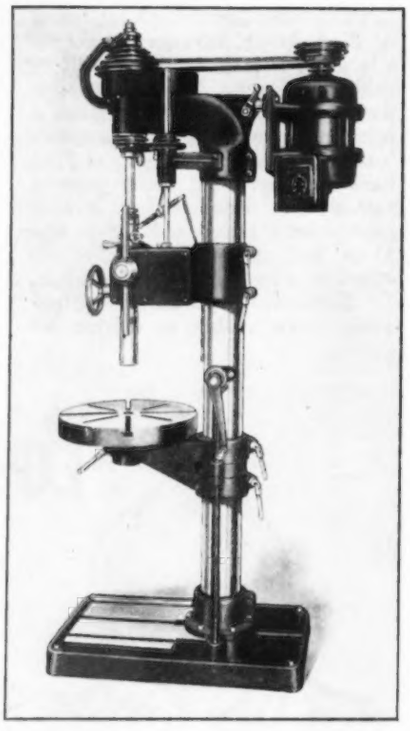

BUFFALO FORGE COMPANY
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cold-rolled strip. Makers of electrical household equipment and shovels are ordering quite freely. The local hot and cold strip mills are operating this week at full capacity.

Bolts, Nuts and Rivets

A heavy volume of specifications against fourth quarter contracts was placed during the closing days of the year, these orders being stimulated by the advances in prices that have become effective on first quarter contracts. This business has provided makers with good backlogs. Automobile manufacturers placed large orders, and business in good volume came from agricultural implement manufacturers and jobbers. Demand from railroads has improved.

Bars, Plates and Shapes

Orders for steel bars since the start of the year have come out in fair volume from forge shops and miscellaneous consumers. New business has come from makers of garden tools. In the construction field, awards are scarce and new inquiry is light. Grade crossing elimination work in Ohio, involving a considerable tonnage of structural shapes and reinforcing bars, is still being held back and plans may not be out for 60 days.

Scrap

Blast furnace scrap, which has lagged behind other grades in the recent upward price movement, has advanced $1 a ton, and $8.50 now appears to be the minimum price at which brokers are able to buy these grades to fill old orders. The advance is attributed to firm prices in other districts, which is preventing brokers from bringing in outside scrap at recent prices. No new consumer demand has developed this month. Prices on steelmaking grades are very firm.

Steel Demand Sustained At St. Louis

ST. LOUIS, Jan. 7.—The final week of the old year witnessed a continued heavy movement of pig iron to melters in this area, giving the quarter the largest shipments for any fourth quarter since 1929.

Activities at mills and foundries have resisted the usual seasonal curtailment, and in some instances there has been little, if any, let-up.

Demand for finished steel holds up well, with warehouse interests reporting the outlook exceedingly good for the next several weeks.

There were no lettings of consequence, but backlogs held by fabricators are sufficiently heavy to keep them busy at the present rate through January.

Scrap buying is negligible, with prices unchanged. Railroad offerings were light and the movement from the country has slowed up due to unfavorable weather. Malleable scrap is very scarce and the strongest item on the list.

Further Expansion by Republic Is Suggested

CLEVELAND, Jan. 7.—Further possible expansion of the Republic Steel Corpn. was indicated by a statement of Tom M. Girdler, president and chairman, in a speech before a civic meeting in Cleveland on Monday. He said he was in New York Saturday trying to buy another steel company. While the name of the company was not disclosed, it is believed that Mr. Girdler referred to the Gulf States Steel Co., Birmingham, as talk of a merger of this company with Republic has been revived.

Testimonial Dinner to W. J. Filbert

A TESTIMONIAL dinner to William J. Filbert, retiring chairman of the finance committee of the United States Steel Corpn., was held at the Waldorf-Astoria, New York, Jan. 7. Ranking officers and directors of the United States Steel Corpn., heads of the subsidiary companies, directors of the American Iron and Steel Institute and leading lights in other steel companies attended.

Miami Steel Piling Award Approved

MIAMI, Fla., Jan. 6.—Col. Horatio B. Hackett, assistant public works administrator, at a city commission meeting last week, confirmed the city's award of 3600 tons of sheet steel piling for the Miami waterfront, which he had previously disapproved. Steel companies participating in the contract are the Jones & Laughlin Steel Corpn., 2022 tons; Carnegie-Illinois Steel Corpn., 674 tons; Inland Steel Co., 674 tons; Kalman Steel Corpn., 230 tons.

Inland Steel Co., Chicago, has just published a new edition of its booklet, "Sizes We Roll." It is of value to those responsible for buying steel, as it includes complete size data on all sheets, strip, bars, plates, structural shapes and semi-finished steel produced by Inland, and also several reference tables useful in ordering steel. A 64-page book, it is of a shape and size convenient for use both in the office and out on the job.

Republic Officers Are Honored at Luncheon

OFFICERS of the Republic Steel Corpn., which is moving its headquarters from Youngstown to Cleveland, were honored with a luncheon given by the Cleveland Advertising Club at the Statler Hotel in that city, Jan. 6. The hotel ballroom, in which the luncheon was held, was filled to overflowing with 300 or more men from Cleveland and vicinity who were present to welcome the Republic executives. A number of prominent industrial and civic leaders sat at the speakers' table with the Republic executives.

Alexander C. Brown, vice-president Cleveland Cliffs Iron Co., presided. Tom M. Girdler, chairman of the board and president of the Republic corporation, was the principal speaker. He said in explaining the removal of the offices to Cleveland that he considered Cleveland the center of the big northeastern Ohio steel making area and that the removal of the offices to that city did not mean abandoning the Youngstown district or Canton and Massillon where the corporation has plants. He expressed the desirability of greater advertising effort on the part of steel makers.

An enthusiastic welcome to the Republic organization was extended by Mayor Harold H. Burton. Arrangements for the luncheon were made by Charles H. Kellstadt, chairman of the Come-to-Cleveland Committee of the Advertising Club.

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PROSPERITY FOR DISTRICT
AWAKENING U. S. STEEL GIANT READY TO LIFT CITY TO OLD PINNACLE
CITY IS HOST TO EXECUTIVES OF U. S. STEEL
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Today's Business
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Pittsburgh Sun-Telegraph

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Eastern Pennsylvania Rate Levels Off at 39 Per Cent

First Quarter Outlook Is Encouraging—Price Advances Less Likely—Scrap Holds Steady

PHILADELPHIA, Jan. 7.—Finished steel buying and mill operations in this area have failed to return fully to pre - holiday levels. Most sellers, however, look for a moderate expansion in demand by the middle of the month, at which time most consumers will have completed their inventory taking and will be in a position to reenter the market and round out stocks.

There is currently less undercover comment on price cutting on sheets and allied flat-rolled products. The market on bars has strengthened considerably, although there are occasional deviations from published price levels. The resale price on pipe continues to be demoralized, although mills insist that some improvement may be forthcoming over the next month. In step with the steadying of established prices there is, oddly enough, less talk of possible price advances for this quarter. Most observers fail to perceive any possible advantage in raising prices now, inasmuch as large consumers are tentatively covered for first quarter needs and those who are not covered would probably be given every opportunity to do so if price revisions were to be announced. On the other hand, influential mills may consider it good strategy to announce higher prices soon in order to drive in a good volume of tonnage and also take the edge off of consumer opposition to higher quotations for second quarter business.

With several minor exceptions, mills in this area are operating at a rate about equal to that of mid-December. The current ingot rate is 39 per cent of capacity, and it is generally believed that there will be no significant deviation from this level over the next month. The average rate of operations in this area a year ago was 10 points lower at 29 per cent of capacity.

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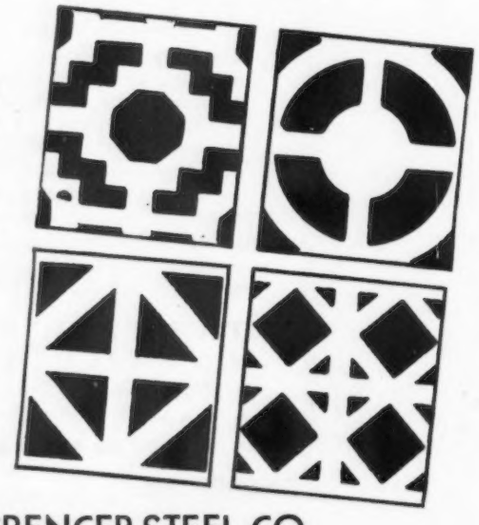

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Pig Iron

First quarter books are open and sellers are ready to take care of new business at the higher price level. However, little new business has been forthcoming, for practically all of the district tonnage buyers have from one to two months' stock on hand. A moderate volume of iron remained undelivered at the end of the year, but in most cases sellers have quietly extended delivery dates at the behest of buyers. Foreign brands continue to enter this port in sizable quantities. For the most part, nearby consumers favor Dutch and Indian brands, although Soviet iron is quietly gaining a foothold despite the political prejudice of some purchasing agents. Foundries in this territory are melting at a rate practically unchanged from a year ago, and prospects for first quarter are considered to be encouraging. So far the Riddlesburg, Pa., furnace has not announced whether it will go into blast, and certain members of the trade are of the opinion that positive action will be delayed for some time, even though the necessary money has been secured from the Government and representatives are canvassing consumers for orders.

Sheets and Strip

The State of Pennsylvania opened bids Jan. 8 on 250 tons of license plate stock. Jobbers are purchasing fair quantities of sheets and strip, autobody stamping plants continue to take deliveries at a maximum rate, and radio makers are continually in the market for moderately sized bookings. Sellers report current sales volume as being about on a par with the early December average, and all mills are confident that this demand will be maintained to an approximate extent throughout the quarter. Most large users have contracted for their quarterly requirements purely as a precautionary measure, inasmuch as there is still talk of possible price advances. The average small buyer, however, refuses to be frightened and continues to purchase only against nearby needs.

Bars, Plates and Shapes

No single job taking more than 100 tons of plates or shapes was awarded during the past seven days. Also, actual awards of reinforcing bars have been few, and the only award worth listing is 200 tons for a sewage development at Hagerstown, Md., which will be supplied by Taylor Davis, Inc. There is a sizable volume of shapes and bars yet active, although ac-

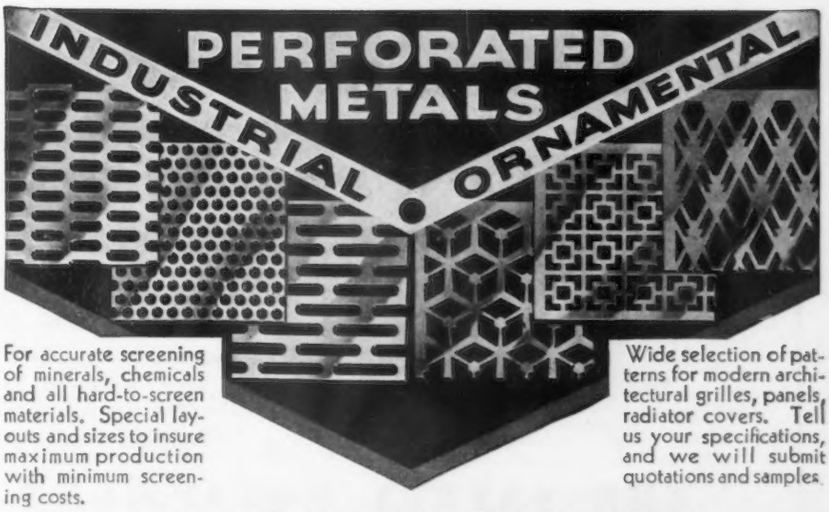
tual awards may be delayed for some weeks as Federal and State officials are slow in forwarding formal approval for the various projects. The volume of new business coming into the market for figuring is far from encouraging, and estimators are currently not nearly as busy as they were a month ago. Local mills are looking forward to early awards from the Navy Department on 700 tons of shapes, on which tenders were submitted Dec. 17, 3000 tons of plates and 157 tons of shapes, on which bids were closed Dec. 27, and 1800 tons of plates for stock, which was bid on Dec. 20.

Imports

The following iron and steel imports were received here during the past two weeks: 1500 tons of iron ore from Persia; 500 tons of pig iron from England; 249 tons of pig iron from British India; 82 tons of steel tubes, 22 tons of steel bars and 13 tons of steel forgings from Sweden; 27 tons of steel bars from Germany; 25 tons of pig iron and 50 tons of ferromanganese from Norway; 26 tons of structural shapes, 13 tons of steel bands and 17 tons of steel bars from

Scrap

Approximately 3000 tons of No. 1 blast furance was sold last week at $6.25 a ton, delivered, and, in addition, a nearby consumer came into the market for a substantial tonnage of No. 2 steel at the quoted price of $11.50 a ton. Even though these new sales are encouraging, the total volume of fresh business placed over the past month has been considerably under sellers' expectations. Nonetheless, dealers and brokers alike continue to put on a bold front and the tone of the market is consequently very steady, with a decided undertone of strength. There is still a firm belief that nearby mills will purchase more freely during this quarter and, of equal importance, there are indications that foreign mills will stop talking so much and start considering prices more in line with what brokers demand. A boat is now loading between 8000 and 9000 tons of No. 1 and No. 2 at Port Richmond for Italian delivery, and another boat is expected in within a fortnight. Seasonal trucking deliveries of automobile and farm scrap from Virginia and Delaware are again a factor in this market, although the total volume of material now being received is considerably under that of a year ago. Morris Shapiro, at Baltimore, has just sold 8000 tons of No. 1 for delivery to Scotland, and is disposing of other tonnages in the domestic market.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Fabricated Structural Steel

Lettings Decline—New Projects Slightly Higher

AMONG awards of 13,650 tons, which compare with 20,000 tons last week, the only bookings of size are 2560 tons for two pavilions at Bellevue Hospital, New York, and 2000 tons for a penstock at Carp, Cal. New projects total 17,850 tons as against 16,450 tons in the previous week and 13,480 tons two weeks ago. The bulk of new jobs is for public work, the largest of which is 4400 tons for the Highland Park bridge at Pittsburgh. At Wilmington, Del., the DuPont Co. will require 2500 tons for an office building. Plate lettings of 12,112 tons include 6000 tons for tanks for the Socony-Vacuum Oil Co. in Italy and 6000 tons for the Texas Co., Texas City. Dock improvements at Miami, Fla., call for 3600 tons of sheet piling. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Swampscott, Mass., 140 tons, high school, to West End Iron Works.

South Boston, Mass., 185 tons, addition to high school, to A. O. Wilson Structural Co.

Roxbury, Mass., 250 tons, Phillip Brooks School, to A. O. Wilson Structural Co.

Troy, N. Y., 310 tons, high school, to Steel Fabricating Co.

Brooklyn, 125 tons, alterations to elevated railroad, Myrtle Avenue, to Post & McCord.

Neponsit, N. Y., 175 tons, power plant for Neponsit Beach Hospital, to Dreier Iron Works.

New York, 2560 tons, pavilions C and D for Bellevue Hospital, to Bethlehem Fabricators, Inc.

New York, 1350 tons, Rockefeller apartment house, Fifty-fourth to Fifty-fifth Streets, to Post & McCord.

New York, 125 tons, bulb angle curbs for Procurement Division of Treasury, to Egleston Brothers & Co.

New York, 100 tons, alterations to pier 73, East River, for Procurement Division of Treasury, to Egleston Brothers & Co.

State of New York, 550 tons, highway bridges at Warners and Norwich, to McClintic-Marshall Corpn.

Manasquan, N. J., 375 tons, State highway bridge, to McClintic-Marshall Corpn.

Pittsburgh, 195 tons, building for National Mortar & Supply Co., to Pittsburgh-Des Moines Steel Co.

Langeloth, Pa., 225 tons, buildings for Climax Molybdenum Co., to Levinson Mfg. Co.

THE SOUTH

Belle, W. Va., 115 tons, ammonia unit for duPont Co., to Virginia Bridge & Iron Co.

CENTRAL STATES

Canton, Ohio, 200 tons, addition to plant of Timken Roller Bearing Co., to Burger Iron Co.

Detroit, 760 tons, die shop for Briggs Mfg. Co., to Whitehead & Kales, Inc.

Detroit, 160 tons, additions to die shop of Murray Corpn. of America, to R. C. Mahon Co.

Harrisburg, Ill., 610 tons, coal handling plant for McNally Pittsburgh Mfg. Corpn., to Kansas City Structural Steel Co.

Michigan and Minnesota, 150 tons, 15 lookout towers for United States Department of Agriculture, to Aermotor Co.

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Chicago, Rock Island & Pacific Railroad, 290 tons, bridge at Manhattan, Kan., to McClintic-Marshall Corpn.

San Haven, N. D., 200 tons, State infirmary, to Minneapolis-Moline Power Implement Co.

Deuel County, Neb., 230 tons, two 250-ft. U-beam spans, to Omaha Steel Works.

WESTERN STATES

State of Washington, 292 tons, State bridges in four counties, to unnamed bidders.

State of Montana, 129 tons, State bridges in three counties, to unnamed bidders.

Kit Carson, Colo., 200 tons, State highway bridge, to American Bridge Co.

San Francisco, 245 tons, State undercrossing at Army Street, to Bethlehem Steel Co.

Ben Lomond, Cal., 125 tons, two State bridges, to Bethlehem Steel Co.

Yakima, Wash., 100 tons, tunnel supports on Yakima Ridge Canal, to an unnamed bidder.

Soledad, Cal., 334 tons, State undergrade crossing, to Ingalls Iron Works Co. Previously reported to Moore Dry Dock Co.

Carp, Cal., 2000 tons, penstock, to Consolidated Steel Corpn.

Union Pacific Railroad, 445 tons, grade crossing elimination, to Consolidated Steel Corpn.

CANAL ZONE

Balboa, 364 tons, naval building, to United States Steel Products Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

State of New York, 675 tons, highway bridges at Rotterdam and Newark.

New York, 390 tons, restoration of bridge in Bronx for New York State Transit Commission.

Pittsburgh, 4400 tons, Highland Park bridge for Allegheny County Authority.

Wilmington, Del., 2500 tons, office building for duPont Co.

THE SOUTH

Richmond, Va., 900 tons, extension to Twelfth Street power station, Virginia Electric & Power Co.

CENTRAL STATES

Detroit, 500 tons, power house addition for Chevrolet Motor Co.

Michigan City, Ind., 350 tons, auditorium and industrial arts building.

State of Iowa, 825 tns, highway bridges.

Jefferson, Wis., 525 tons, Racine Street bridge and overhead; bids Jan. 17.

Kenosha, Wis., 300 tons, grade separations, Chicago & North Western Railway, Foley Brothers, Inc., St. Paul, Minn., general contractor.

Cook County, Ill., 1575 tons, bridges.

Havana, Ill., 1800 tons, bridge; new bids to be taken Jan. 17.

East St. Louis, Ill., 500 tons, Twenty-sixth Street bridge.

State of Illinois, 4260 tons, highway projects; bids Jan. 17.

St. Francis, Kan., 450 tons, Republic River State bridge.

FABRICATED PLATES

AWARDS

Texas City, Tex., 6000 tons, tanks for Texas Co., to Chicago Bridge & Iron Works.

Italy, 6000 tons, tanks for Socony-Vacuum Oil Co., to an American fabricator.

Inglewood, Cal., 112 tons, welded pipe for city water system, to Western Pipe & Steel Co.

NEW PROJECTS

Pittsburgh, 1500 tons, 10 standard 1000-ton coal barges, riveted or welded types, for Pittsburgh Coal Co.

Vicksburg, Miss., unstated tonnage, derrick boat for United States Engineer Office.

Fresno, Cal., 125 tons of 10-in. welded pipe for Treasury Department; bids opened.

SHEET PILING

AWARDS

Miami, Fla., 3600 tons, for dock improvements: 2022 tons to Jones & Laughlin Steel Corpn., 674 tons to Inland Steel Co., 674 tons to Carnegie-Illinois Steel Corpn., 230 tons to Bethlehem Steel Co.

NEW PROJECTS

Fort Peck, Mont., 300 tons, Circular No. 246; bids Jan. 14.

New York Tunnel Grant Is Proposed

WASHINGTON, Jan. 7.—The new 3800-ft. traffic tunnel under East River at New York, extending from Thirty-eighth Street, Manhattan, to a point near Borden and Jackson avenues in Queens, to be financed by a PWA loan and grant of $58,365,000, will be completed in time for the proposed world's fair in New York in 1939, according to Harold L. Ickes, Public Works Administrator. This announcement was made when Mr. Ickes was advised that enabling legislation has been drafted for introduction in the New York legislature to create the East River Tunnel Authority.

The Authority will build and operate this latest unit in New York City's transit facilities. The legislation was prepared by the PWA legal division and the Corporation Counsel of New York City. The East River tunnel will have two traffic tubes, each carrying two lanes of traffic in the same direction. Approaches on Manhattan will be about 1600 ft. long and the Queens approaches, about 2400 ft. long. The total allotment is comprised of a loan of $47,130,000 at 4 per cent interest, which is to be repaid from tolls collected by the authority, and a grant of $11,235,000 to cover 30 per cent of the cost of labor and materials.

Plate Work Is Conspicuous In New York Market

Tanks and Railroad Equipment Open Up Outlet for Heavy Products — Aluminum Bought for Connecticut License Plates

NEW YORK, Jan. 7.—Plate work has supplanted structural steel for the time being as a conspicuous outlet for large tonnages. The Texas Co. has awarded tanks, calling for 6000 tons of plates, for erection at Texas City, Tex., to the Chicago Bridge & Iron Works. The Socony-Vacuum Oil Co. has placed tanks for erection in Italy, requiring 6000 tons, with an American fabricator. Close to 15,000 tons of steel, largely plates, for four tankers awarded to two shipbuilders by the Pan-American Petroleum & Transport Co. has been placed with the mills. Considerable steel will be required for a freight equipment program, calling for both new cars and car repairs, which is being launched by the Lehigh Valley. The Bessemer & Lake Erie has entered the market for 2000 hopper cars, 1000 gondola cars and 25 locomotives.

Day-to-day demand for finished steel has shown little change from December volume. On cold-finished sheets, mills are five to six weeks behind on deliveries and on light hot-rolled sheets they are about four weeks behind. On other products fairly prompt deliveries are available. Among individual products, alloy steel bars are perhaps in most active demand at present.

Tin plate producers entered the new year with heavy stocks. The stocking up of mill warehouses with a wide assortment of sizes is a form of competition that first made its appearance early in 1935. Under this plan, mills insure themselves against loss of business because of failure to meet delivery requirements. Heavier stocking has forced mills to enlarge their warehouse space and to introduce measures for the protection of the plate, such as better packing and control of warehouse humidity. The greatest expense involved in stocking, however, is the interest charge on the large inventory carried.

Stainless steel lost out to aluminum as a material for the new permanent automobile license plates to be issued by the State of Connecticut. It is estimated that about 135 tons of aluminum will be required.

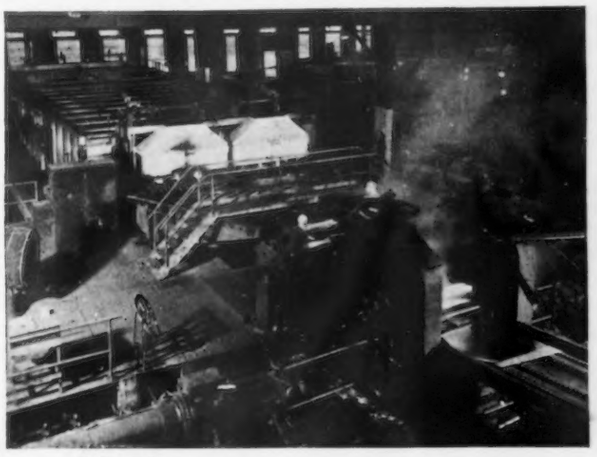
Little is heard in this district about imminent advances in finished steel prices. While the need for an advance is recognized, the persistence of weakness in scattered items, such as reinforcing bars, wire nails and resale pipe, has tended to dampen the enthusiasm of sellers.

Pig Iron

First quarter sales of iron in this district are heavier. Last week 2775 tons was booked, compared with 850 tons sold in the period ended Dec. 22. The business was unevenly divided, with some sellers figuring to the extent of only a carload or two. Specifications for year-end shipments just about cleaned up contracts made prior to the price advance on Dec. 1, and very little iron was carried forward at a write-up. While producers do not look forward to any immediate marked increase in buying, market sentiment is bright. One stimulant to the trade this year is expected to be supplied by a livelier demand for cast iron pipe inasmuch as industry confidently looks forward to a greater volume of construction work as compared with last year. Heavy hardware equipment should likewise benefit. A number of casting foundries have not yet completed inventory taking, and consequently are making no moves to ascertain forward needs. Others, it is stated, already have on hand sizable quantities of iron which must be used up before they will be in the market again.

Reinforcing Steel

Reinforcing steel awards are in minor volume at present, though a number of projects slated for future attention should enliven the



Any Mill CAN BE BASICLY CONTINUOUS

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market eventually. Government jobs predominate. Bids were opened Dec. 30 on 455 tons by the State procurement division of the Treasury for a New York City job. W. Ames and Co., Jersey City, was low on 390 tons, while Bethlehem Steel Co. was low on 65 tons. Bids were close with some quotations as much as $8 to $10 under the quoted market price. No award has yet been made of the 1400 tons for the New Jersey approach to the Midtown tunnel, New York, on which bids were opened Dec. 19.

Scrap

Brokers here have entered the new year with less than a normal amount of tonnage on their books. Nevertheless the market has an exceptionally strong undertone inasmuch as dealers have very little material on hand and are inclined to withhold a portion of what they do have in anticipation of increased demand and improved prices. The export situation here still does not show the snap that brokers had prophesied. Japan is showing more interest, but this interest has not yet been translated into actual orders of any significance. Furthermore, new Italian buying has tapered off. However brokers are loading steel for Italian delivery against old orders at unchanged price levels, and some material is being accumulated on barges for future Japanese shipment. England continues to be a moderate outlet for cast and steel grades. The demand from domestic consuming centers is spotty and not very urgent. Some steel and cast is being loaded in nearby Jersey points for eastern Pennsylvania delivery, but the absence of new business has curtailed the volume of deliveries to a considerable extent.

Dip in Sheet Bookings In Southern Ohio

CINCINNATI, Jan. 7. — Although shipments of pig iron during the closing days of 1935 were unusually heavy, a fair proportion of melters failed to complete fourth quarter commitments. Furnace interests are showing lenience and are permitting users to take iron previously ordered and are not insisting on renewal contracts at the present quotations. This attitude, combined with substantial inventories in melters' hands, has retarded ordering, since only those in definite need of iron are entering the market. The district melt is up to about 50 per cent of capacity. Machine tool foundries report a definite increase in their bookings, while stove and automotive melters continue to operate at a steady rate.

Although backlogs of district sheet steel producers have held operations at close to mill capacity, new bookings have declined to about 80 per cent. Part of this recession resulted from holiday influences, but a tendency of automobile users to curtail ordering is also noticed. Motor car manufacturers are reported to have passed peak operations in December and are now retarding purchases to await car purchasing. The leading sheet interest reported a slight reduction in strip mill operations during an adjustment of equipment. Open-hearth output is steady at about 82 per cent of capacity.

Foundry coke specifications are in substantially unchanged volume.

Scrap dealers are marking time. The steadiness of prices indicates a strong market undertone despite the fact that current bookings are not great. Anticipation of improved sales as result of heavy steel-making operations adds to dealer confidence that present price levels will hold.

Boston Buys 1850 Tons of Cast Pipe

BOSTON, Jan. 7.—Export business in scrap continues to be the feature of the iron and steel trade here. The export scrap market held steady to strong in the past week and leading interests are looking for an advance in several lines directly. The domestic market is also strong, with prices showing a tendency to become firmer. One steamer, partly loaded, left here Friday, proceeding to Providence, R. I., to complete an export load. Another steamer arrived at Boston last week to load scrap for a port to be announced later. Exports of scrap iron and steel from Boston during the week ended Friday, Jan. 3, totaled 5867 tons. Cotton ties have advanced to $5.50 to $5.60, while No. 2 cast is up, quoted at $8 to $8.25.

The advance of $3 a ton in cold-finished bars out of warehouse went into effect Jan. 2, but the customary start of the year dullness prevails and business has been negligible. It is expected there will be a pick-up in warehouse business toward the end of the month.

Structural lines remain quiet, with but scattered odd-lot sales taking place. There are some PWA projects hanging fire, but these have not been closed.

The 1850 tons of cast iron pipe for the city of Boston was awarded to Warren Foundry & Pipe Co., which company was the low bidder. Milford, Mass., has awarded 80 tons of pipe to the same company.

Operations Off In South

BIRMINGHAM, Jan. 7.—The iron and steel markets are gradually recovering from the usual holiday lull and by the end of the current week should be back on their routine course. New steel tonnage last week was better than expected. There was a fair volume in all lines, including railroad products. Pig iron buying still is sluggish and it may be some time before there is a marked upward swing, on account of the heavy buying in the last quarter.

The Ensley rail mill closed Jan. 1 but is scheduled to resume about Feb. 1. January requirements were rolled ahead of time so as to give employees money for the holidays.

Last week 12 open-hearth units were in production, five being at Fairfield, three at Ensley and four at Alabama City. This week the Ensley open-hearths will be down, leaving nine units active.

There is no change in blast furnace operations, with 12 active. The closing of the Ensley rail mill has not yet affected the Ensley blast furnaces.

Buffalo Rate Rises

BUFFALO, Jan. 7.—The first week of the new year finds operations of steel mills here maintaining the December pace, and good prospects of increased activity later in the month or early next. Bethlehem's Lackawanna plant is operating 13 open-hearth furnaces; Republic Steel Corpn., five with a possibility of this climbing to six, and Wickwire Spencer Steel Co., one. The Seneca sheet division of Bethlehem is running at 90 per cent. The hot mill unit of the new Bethlehem strip mill has gone into operation and, while a considerable supply of cold slabs has been prepared in advance to feed this unit, it is highly probable that continuous operation will soon call for increased open-hearth output.

The pig iron market is quiet, but shipments are fair. Many foundries are still busy on their inventories, but signs are apparent that pig iron buying will take place in quantity in the near future. Operation of Niagara Falls foundries allied with the chemical industry is good and an increase is expected there.

Quiet prevails in the fabricated structural steel and reinforcing bar markets, but the amount of PWA work booked means that these industries will have a busy spring.

The scrap market continues firm with a strong undertone. Dealers are having difficulty filling old orders; the supply coming out is scant. Outside markets are strong, making an outlet for old material gathered in the vicinity of Buffalo. For instance, with No. 1 bundles at $14.25 and No. 2 bundles at $12.50, Steubenville, it is practical to ship these materials from Niagara Falls.

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Safety Limit Stop for Cranes

THE YOUNGSTOWN LIMIT STOP—recognized and used by industry as a dependable and positive means of protection against overhoisting—has now been improved by the addition of roller bearings to the counter-weight, cable-sheave and main shaft.

The enclosing cover has also been made heavier and fits against shoulders on the case, making the enclosure a very sturdy, injury-resisting unit.

Youngstown Limit Stops are easily applied to both new and old cranes and are completely described in Bulletin 1035A. Write for a copy.

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Gain in Coast Concrete Bar Awards in 1935

SAN FRANCISCO, Jan. 6.—A gain of approximately 100 per cent in reinforcing bar awards in the Coast region was made in 1935 over those of 1934. Lettings by the Metropolitan Water District of various units of the Colorado River aqueduct were largely responsible for the year's increase. The award in September of 83,790 tons of reinforcing bars by the district to 22 mills was the largest booking ever placed on the Coast.

Reinforcing bar awards in the seven Western States for 1935 totaled 215,809 tons against 106,852 tons for 1934. Structural steel purchases during the two years were fairly even with an aggregate of 122,498 tons during 1935 and 129,028 tons for the previous year. Cast iron pipe and steel plates showed slightly greater losses. Contracts for 35,633 tons of cast pipe and 49,894 tons of plates were placed during the year just closed against 43,947 tons and 56,403 tons respectively for 1934.

A glance at the pending list for 1936 shows several projects involving major tonnages. The Metropolitan Water District will open bids tomorrow on a 16-mile unit of the Colorado River aqueduct in which 38,000 to 44,000 tons of plates are involved. Approximately 1000 tons of steel will be required for the Iron Mountain pumping plant on which the district will open bids Jan. 14. The El Capitan-Lakeside pipe line, to be constructed near San Diego, Cal., calls for 3050 tons of plates. Preliminary estimates on the San Diego-Coronado suspension bridge, on which a hearing is to be held Jan. 17, place the structural steel requirements at 10,000 tons. However, it is doubtful if this project will receive approval as the Navy Department is expected to enter objections. The floating drydock for Honolulu, on which bids are expected in February, will involve approximately 20,000 tons of plates and 12,000 tons of structural steel. A union station at Los Angeles, for which working drawings are being completed, will require 8000 tons of structural steel.

The first quarter opens with no change in price schedules at the mills and little likelihood of immediate revisions. With general gains in mill and warehouse business during the past year, the trade starts 1936 with confidence.

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produce high quality precision and production drilling machines. They recognize the fact that today's drilling equipment must be unusually rugged and therefore for highly stressed bronze members specify "Ampco Metal." Feed nuts, gears, bushings, and other parts made of Ampco Metal help uphold the Baker standard of quality.

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Forging and Forming in 1935

(CONTINUED FROM PAGE 39)

steel include auto body, stove, refrigerator panel and various other dies.

Discussing improvements in cold header die steels, C. A. Liedholm, metallurgist, and T. S. Fitch, assistant superintendent of the Jessop company, state:

"In the cold header steels there has been greater attention given to the cleanliness of steel. In this same field there has been much improvement in the uniformity and fineness of the metallographic structure, which has been attained through rigid temperature control in the hot working.

"Improved methods of deoxidizing the steel in the melting operation and closer temperature control in the casting have helped to improve the die steels. Special ingot molds have been designed, such as Firth's Winged Ingot, to eliminate the central part of the ingot in which are usually concentrated the undesirable non-metallic inclusions. Attempts are also being made to develop practices which will ensure slower cooling of the ingot and thus permit all non-metallic inclusions to rise into that portion of the ingot which is later cropped off.

"The inspection of all dies and die steels has been made much more stringent. It is now common practice to hot etch both ends of all bars to assure freedom from porosity. Many concerns making die steels now use a machine for detecting cracks known as the Magnaflux Detector. The structures are also checked under the microscope to determine the extent of spheroidization and the uniformity of structure."

Mr. Harrison states that experimental work in die design to provide better disposal facilities for the flash and to avoid the tendency of the flash to become too large has resulted in the addition of "guttering" to many dies to give asurance that the billet being forged will flow into the die rather than into the flash. This practice, he states, is frequently followed where its use is applicable.

Pipe Lines

Humble Pipe Line Co., Houston, Tex., subsidiary of Humble Oil & Refining Co., same place, plans new 8-in. welded steel pipe line from east Texas oil field district to Baytown, Tex., by way of Groesbeck and Hearne, for transmission of mixtures of gasoline and butane gas for polymerization process at oil refinery of parent organization at terminus noted. Company has contracted with Hanlon-Buchanan, Inc., for butane and propane gas supply from east Texas. Project will include several large pumping stations. Cost close to $1,000,00.

Grand Rapids Gas Light Co., Grand Rapids, Mich., has applied for permission to build new welded steel pipe line for natural gas supply, recently noted in these columns, consisting of 10¾-in. diameter pipe from Belvidere in Mecosta-Montcalm gas field district to Grand Rapids city limits, about 60 miles. Plant will be built in city for mixing and distributing natural and artificial gas. Cost about $850,000. Glenn R. Chamberlain is president.

San Diego, Cal., will close bids on or about Jan. 21 for El Capitan-Lakeside steel pipe line for main water system, consisting of four miles of 48-in., and two miles of 36-in., with alternate bids on electrically-welded steel pipe and electrically-welded concrete-protected steel cylinder pipe, respectively. Cost about $430,000. Financing has been concluded through Federal aid. Fred D. Pyle is city hydraulic engineer.

Supervising Construction Engineer, Indian Service, Department of Interior, Billings, Mont., asks bids until Jan. 15 for quantity of steel pipe; also for iron pipe and pipe fittings.

Consumers Power Co., Jackson, Mich., has authorized immediate construction of new 10-in. welded steel pipe line from Millbrook Hinton natural gas fields, Mecosta and Montcalm counties, to Lansing, Mich., and vicinity for natural gas transmission. Branch steel pipe lines will be built to several other communities in Lansing area for commercial gas supply. Cost close to $500,000.

Arcadia, Cal., plans about 12,000 ft. of steel pipe for water system. Cost about $75,000 with fittings, valves and miscellaneous work. Financing has been arranged through Federal aid. Currie Engineering Co., Anderson Building, San Bernardino, Cal., is consulting engineer.

United States Engineer Office, First District, New York, asks bids until Jan. 14 for 200 ft. of 4-in. steel pipe, with alternate bids on 4-in. black iron, for Waterbury, Vt. (Circular 229).

Almira, Wash., has awarded 500 tons additional 1-in. steel pipe for cooling system at Grand Coulee dam, to Laclede Tube Co.

Heppner, Ore., will take bids Jan. 17 on 110 tons of 8-in. steel pipe for city water system.

T. E. Conklin Brass & Copper Co., Inc., on or about Jan. 20 will occupy new offices at 54-60 Lafayette Street, New York. Company is celebrating seventy-fifth anniversary.

World Visible Supplies of Tin Drop 1267 Tons Despite Higher Quotas

Copper and Other Metals Largely Unaffected By AAA Ruling—Lead Sales in Moderate Volume, But Beneath Prior Levels—Zinc Continues Dull

NEW YORK, Jan. 7.—Apparently the Supreme Court ruling against AAA has had no effect on the market for copper. Buying remains at extremely low levels, though yesterday indicated some improvement when 1028 tons was booked as opposed to but 1299 tons for all preceding operating days this month. Uncertainty in the London market has, to some extent, depressed the domestic trade. In London this morning the price for electrolytic ranged between 8.57c. and 8.62½c. a lb. The 9.25c. a lb. domestic quotation holds steadily.

Tin

The market is still in a listless condition owing partly to year-end interruptions and partly to the unsatisfactory state of affairs abroad. Spot prices have eased further, and, while dealers experienced some pick-up in sales as quotations receded, less inquiry was forthcoming than one might logically have expected. The price today for spot Straits metal at New York is 46.87½c. a lb., which is the lowest recorded for quite some time. This morning in London standard prompt sold for £210 10s, while futures were £201 17s 6d. In the East the price was £207 10s. United States deliveries of tin in December totaled 5360 tons, compared with 4035 tons the month before and 4530 tons a year earlier. In all of 1935 deliveries were 59,110 tons as against 46,215 tons for 1934. On Dec. 31, the world's visible supply of tin stood at 13,782 tons, a decline of 1267 tons from the preceding month.

Zinc

This market remains quiet and unchanged. Sales last week came to approximately 1850 tons. Shipments to consumers are still large, and apparently stocks will show a further appreciable reduction when December statistics become available. As mentioned before, the decline in the price of zinc abroad has caused some uneasiness here, but no tendencies for domestic quotations to weaken are distinguishable at present. The Supreme Court decision outlawing AAA had practically no effect upon the market. The price of zinc continues steady at 4.85c. a lb.

Ingot Brass and Bronze

The Non-Ferrous Ingot Metal Institute reports that in 28 days ended Dec. 27, the average prices paid its membership for commercial 80-10-10 and commercial 85-5-5-5 brass ingots were 10.611c. and 9.124c. a lb. respectively. In the preceding period the prices were 10.566c. and 9.032c.

Lead

Buying of lead has quieted down during the past two weeks as compared with the active state of demand which prevailed generally in the final quarter of 1935, but optimism among sellers has not been dimmed. The weakened condition of the London metal market, coincident with, if not brought on by, the change in this Government's silver policy, has been one factor responsible for the changed attitude among consumers, though an interrupted flow of business is entirely normal at this time of year and should not be overlooked. January positions are estimated to be about 75 per cent covered, while the bulk of February has yet to be touched.

Non-Ferrous Averages

The average prices for the major non-ferrous metals for December, based on daily quotations in THE IRON AGE, are as follows:

	Average
Electrolytic copper, N. Y.‡.	9.000c. a lb.
Lake copper, Eastern delivery	9.375c. a lb.
Straits tin, spot, N. Y.	49.765c. a lb.
Zinc, East St. Louis	4.850c. a lb.
Zinc, New York	5.225c. a lb.
Lead, St. Louis	4.350c. a lb.
Lead, New York	4.500c. a lb.

‡Price ¼c. higher in Connecticut Valley.

The Week's Prices. Cents Per Pound for Early Delivery

	Dec. 31	Jan. 2	Jan. 3	Jan. 4	Jan. 6	Jan. 7
Electrolytic copper, Conn.*	9.25	9.25	9.25	9.25	9.25	9.25
Lake copper, N. Y.	9.37½	9.37½	9.37½	9.37½	9.37½	9.37½
Straits tin, Spot, New York	48.60	48.25	47.62½	....	47.00	46.87½
Zinc, East St. Louis	4.85	4.85	4.85	4.85	4.85	4.85
Zinc, New York†	5.22½	5.22½	5.22½	5.22½	5.22½	5.22½
Lead, St. Louis	4.35	4.35	4.35	4.35	4.35	4.35
Lead, New York	4.50	4.50	4.50	4.50	4.50	4.50

*Delivered Connecticut Valley; price ¼c. lower delivered in New York.
†Includes emergency freight charge.

Aluminum, virgin 99 per cent plus, 19.00c.-22.00c. a lb., delivered.
Aluminum, No. 12 remelt, No. 2 standard, in carloads, 17.00c. a lb., delivered.
Nickel, electrolytic, 35c. to 36c. a lb. base refinery, in lots of 2 tons or more.
Antimony, Asiatic, 13.75c. a lb., New York.
Quicksilver, $76.00 to $78.00 per flask.
Brass ingots, commercial 85-5-5-5, 9.25c. a lb., delivered; in Middle West ¼c. a lb. is added on orders for less than 40,000 lb.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	48.00c. to 49.00c.
Tin, bar	46.00c. to 47.00c.
Copper, Lake	10.25c. to 11.25c.
Copper, electrolytic	10.25c. to 11.25c.
Copper, castings	10.00c. to 11.00c.
*Copper sheets, hot-rolled	16.25c.
*High brass sheets	14.62½c.
*Seamless brass tubes	16.62½c.
*Seamless copper tubes	16.75c.
*Brass rods	13.12½c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	5.00c. to 6.00c.
Lead, bar	6.00c. to 7.00c.
Lead, sheets	8.25c.
Antimony, Asiatic	17.00c. to 18.00c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.50c. to 20.00c.
Solder, ½ and ½	29.50c. to 30.50c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

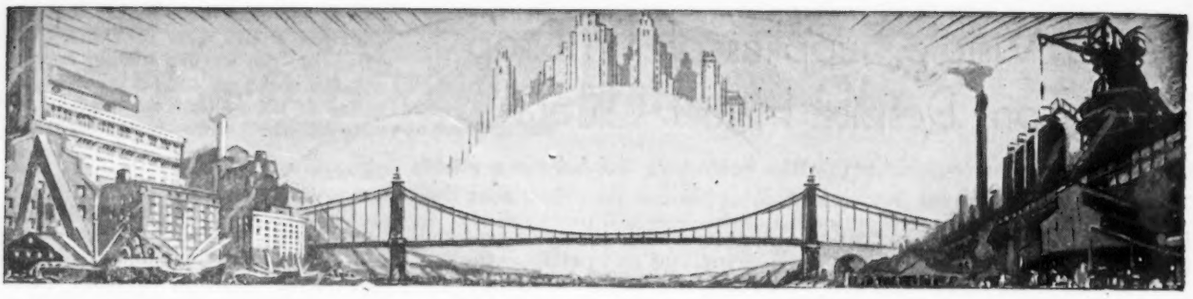
Delivered Prices per Lb.

Tin, Straits pig	51.25c.
Tin, bar	53.25c.
Copper, Lake	10.25c.
Copper, electrolytic	10.25c.
Copper, castings	10.00c.
Zinc, slabs	6.25c. to 6.50c.
Lead, American pig	5.20c. to 6.50c.
Lead, bar	8.50c.
Antimony, Asiatic	17.00c.
Babbitt metal, medium grade	19.25c.
Babbitt metal, high grade	55.50c.
Solder, ½ and ½	29.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	7.12½c.	7.87½c.
Copper, hvy. and wire	7.00c.	7.50c.
Copper, light and bottoms	6.00c.	6.50c.
Brass, heavy	4.00c.	4.62½c.
Brass, light	3.25c.	4.00c.
Hvy. machine composition	6.00c.	6.50c.
No. 1 yel. brass turnings	5.12½c.	5.62½c.
No. 1 red brass or compos. turnings	5.62½c.	6.12½c.
Lead, heavy	3.50c.	3.87½c.
Zinc	2.50c.	2.87½c.
Cast aluminum	12.12½c.	13.25c.
Sheet aluminum	13.25c.	14.75c.



Plant Expansion and Equipment Buying

Machine Tool Business Begins Post-Holiday Upturn — Automotive Orders Increasing

MACHINE tool orders are already beginning to show improvement and manufacturers believe the upturn they anticipated in January will soon be in full swing. Inquiry is substantial and much prospective business is still hanging fire which came to the attention of sellers even before the Cleveland show. Milling machines and grinders are in particularly heavy demand and some builders are booked to capacity on this type of business.

The automotive industry is engaged in an important expansion program, although new facilities are confined for the most part to parts manufacture. Large sums will be spent for tools and presses. It is also believed likely that larger earnings during 1935 will cause a number of large interests to adopt more liberal spending policies with regard to new equipment.

◀ NORTH ATLANTIC ▶

National Distillers Products Corpn., 120 Broadway, New York, plans expansion and improvement program at distilling plants in various parts of country to cost $4,500,000, including buildings and equipment. Of this amount about $1,250,000 will be expended at plant of Penn-Maryland Corpn., Carthage, Ohio, an affiliated interest, and plans for immediate expenditure of $750,000 at this plant for additions and machinery have been approved. Company will expend approximately $1,750,000 at plants in Kentucky area, including remodeling and extensions in former distillery of E. H. Taylor Distillery, Frankfort, Ky., recently acquired, and installation of additional equipment. Thomas F. Brown is vice-president in charge.

Standard Brake Shoe & Foundry Co., 30 Church Street, New York, has approved plans for new one-story foundry, 122 x 150 ft., at Memphis, Tenn. Cost over $75,000 with equipment.

Washburn Wire Co., foot of East 118th Street, New York, manufacturer of round and flat steel wire products, has filed plans for extensions and improvements in four five-story factory units. Cost about $150,000 with equipment. Bart and John P. Walther, 103 East 125th Street, are architects.

American Can Co., 230 Park Avenue, New York, has leased about 35,000 sq. ft. floor space in building at Commerce and Drennan Streets, Houston, Tex., for new branch plant, primarily for storage and distribution. Houston offices of company are in Bankers' Mortgage Building.

Schenley Distillers Corpn., 20 West Fortieth Street, New York, will carry out expansion and improvements at different plants to cost about $2,700,000, including extensions now under way, additional buildings and equipment. Work will comprise enlargement of Joseph E. Finch & Co. distillery at Schenley, Pa., with equipment; expansion in Old Quaker Co. distillery, Lawrenceburg, Ind., and extensions in plant of George T. Stagg Co., Frankfort, Ky. Company will also erect new multi-story storage and distributing buildings at three plants noted. Similar multi-story units will be built at James E. Pepper & Co. distillery, Lexington, Ky. Company is arranging financing totaling $15,000,000, part of fund to be used for purpose noted. Carl J. Kiefer, Schmidt Building, Cincinnati, is vice-president in charge of plant construction.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 14 for four electric welding sets and spare parts for Brooklyn and Mare Island navy yards (Schedule 6873); steam and air pressure-reducing valves for Brooklyn and Philadelphia yards (Schedule 6912); four ½-ton and two ¼-ton motor-operated rigid suspension-type wire rope whip hoists, with electrical control apparatus and spare parts for Brooklyn and Charleston yards (Schedule 6901).

Renaissance Metal Works, Inc., 510 East Seventy-fourth Street, New York, manufacturer of bronze products, has leased two floors in building at 523 East Seventy-third Street for plant.

Merck & Co., Lincoln Avenue, Rahway, N. J., manufacturer of industrial chemicals, etc., has filed plans for two one-story additions. Cost about $40,000 with equipment.

Berkenmeier & Co., 1091-95 Springfield Avenue, Irvington, N. J., stoves and ranges, has leased one-story building at 164 Coit Street, about 5000 sq. ft. floor space, for new stove rebuilding and repair works, with part of building for storage and distribution.

United States Engineer Office, First District, New York, asks bids until Jan. 16 for one combination tilting arbor saw, jointer and mortiser (Circular 233); 2-in. bronze hose (Circular 242).

Philadelphia Spring Works, Inc., 3950 North Broad Street, Philadelphia, has leased new one-story building to be constructed at 3951-53 North Broad Street for plant.

Quartermaster, Carlisle Barracks, Carlisle, Pa., asks bids until Jan. 22 for one 200,000-gal. elevated steel tank (Circular 26).

Borough Clerk, Quakertown, Pa., asks bids until Jan. 15 for 2000-kw. turbo-generator unit with accessories, surface condenser equipment and one crane for municipal light and power plant. James Parker is superintendent at plant.

Commanding Officer, Frankford Arsenal, Philadelphia, asks bids until Jan. 14 for two Dumore grinders (Circular 283); until Jan. 16, aluminum horn castings (Circular 275).

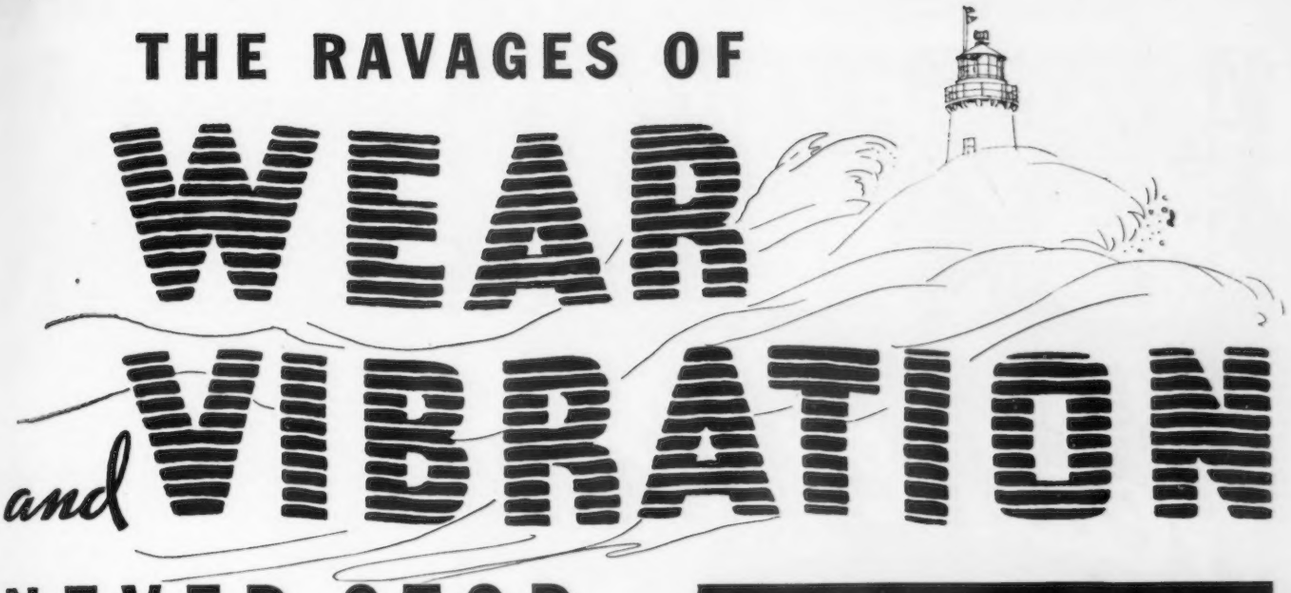
◀ NEW ENGLAND ▶

Commanding Officer, Springfield Armory, Springfield, Mass., asks bids until Jan. 13 for tool parts, including external hob, holding fixture for thread miller, etc. (Circular 100); until Jan. 16, two plain tool and cutter grinders, complete with motor drive (Circular 95); until Jan. 17, one inclinable punch press, one straight-sided double crank press, and for one gap frame open back press, all motor driven (Circular 85).

Bryant Electric Co., Weaver Avenue, Bridgeport, Conn., manufacturer of electric switches, sockets, etc., subsidiary of Westinghouse Electric & Mfg. Co., East Pittsburgh, has engaged Fletcher-Thompson, Inc., 1336 Fairfield Avenue, architect and engineer, to prepare plans for one-story addition, 90 x 200 ft., for Hemco Moulding Division, manufacturer of insulated moldings and kindred electrical specialties. Cost about $70,000 with equipment.

Armour & Co., Chicago, meat packers, plan new branch meat-packing plant at Boston, where tract has been leased from New York, New Haven & Hartford Railroad. Cost about $310,000 with equipment. Project will include one-story automobile

THE RAVAGES OF WEAR and VIBRATION NEVER STOP..



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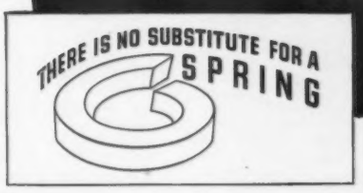

SPRING WASHER INDUSTRY

ONLY A SPRING WASHER HAS *Live Action!*

service, repair and garage unit for company motor trucks and cars.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 14 for motor-driven upsetting and forging machines for Boston Navy Yard (Schedule 6893).

Dewey & Almy Chemical Co., 235 Harvey Street, Cambridge, Mass., manufacturer of industrial chemicals, etc., has let general contract to L. C. Blake Construction Co., Milton, Mass., for one-story addition, 70 x 110 ft., primarily for storage and distribution. Cost close to $40,000 with equipment.

SOUTH ATLANTIC

City Council, Fort Pierce, Fla., asks bids until Jan. 14 for extensions and improvements in municipal electric light and power plant, including new turbo-generator unit with accessories, condenser, boiler unit and auxiliaries, steel stack, switchboard and instruments and miscellaneous equipment. Gilbert A. Youngberg, Lynch Building, Jacksonvile, Fla., is consulting engineer.

Commanding Officer, Augusta Arsenal, Augusta, Ga., asks bids until Jan. 27 for one automotive cylinder boring bar, one valve seat grinder, one electric testing stand, and other equipment (Circular 4).

Hygeia Coca Cola Bottling Co., Pensacola, Fla., has let general contract to Barge-Thompson Co., 136 Ellis Street, N.E., Atlanta, Ga., for two-story mechanical bottling plant. Cost about $100,000 with equipment. Francis P. Smith, Norris Building, Atlanta, is architect.

Swift & Co., Chicago, meat packers, have let general contract to Brazell, Miller & Newbanks Co., Norris Building, Atlanta, Ga., for addition to branch plant at Moultrie, Ga., and improvements in present units. Cost close to $45,000 with equipment.

SOUTH CENTRAL

Kentucky Independent Packing Co., Lexington, Ky., meat packer, has acquired former meat-packing plant of Munn Brothers Co., Old Frankfort Pike, and will remodel for new plant, including construction of additions. Cost close to $100,000 with machinery.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until Jan. 13 for metal-clad switchgear, including steel housings, etc., for Wheeler hydroelectric power plant.

Chattanooga Steels, Inc., Chattanooga, Tenn., iron and steel specialties, recently organized by E. H. Cairns, Chattanooga, and associates, has taken over building formerly occupied by Street Brothers Machine Co. for new storage and distributing plant.

Swann Co., Inc., Birmingham Building, Birmingham, Theodore Swann, president, recently organized to manufacture industrial chemicals, has plans for new two-story and basement plant at Thirty-second Street and Second Avenue South. Three one-story buildings in immediate vicinity also have been leased for plant units. Cost over $60,000 with equipment.

Common Council, Brewton, Ala., plans new artificial gas plant and distribution system. Cost about $51,000 with equipment. Financing has been arranged through Federal aid.

OHIO AND INDIANA

Dayton Power & Light Co., Dayton, Ohio, has approved plans for addition to steam-electric generating plant at Miller's Ford, near city, including new 42,000-kw. turbo-generator unit, for which award has been made to General Electric Co. Contracts for miscellaneous equipment will be placed soon. Addition will require over one year for completion. Cost about $3,000,000.

Lubri-Zol Corpn., St. Clair Avenue and Lloyd Road, Wickliffe, Ohio, manufacturer of lubricating oils, compounds, etc., has awarded general contract to Sam W. Emerson Co. 1836 Euclid Avenue, Cleveland, for one-story addition, 66 x 100 ft. Cost close to $50,000 with equipment.

Washington Breweries Co., Second Avenue and Perry Street, Columbus, Ohio, has let general contract to Branch Construction Co., 1030 West Third Street, for one-story addition. Cost about $35,000 with equipment.

Midland Steel Products Co., Madison Avenue and West 106th Street, Cleveland, manufacturer of automobile frames, brakes, metal stampings, etc., has leased about 75,000 sq. ft. in former plant of Winton Motor Co., and will remodel for expansion. Company will increase line of output in new extension, including oil-operated refrigerating units and parts, new type of gasoline pressure stove burner and portable gasoline pressure stoves. Production is scheduled to begin soon. E. J. Kulas is president.

Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, asks bids until Jan. 14 for 12 dry mounting press assemblies, complete with tacking iron, etc. (Circular 451); until Jan. 16, brass tubing, brass rods, copper tubing, copper rods, etc. (Circular 447), 11 sets inflation equipment, gear flotation (Circular 450); until Jan. 17, lamp and shaft assemblies, gun camera gears, gun camera arm assemblies, gun camera governor assemblies, gun camera muzzles (Circular 457), two flight indicators (Circular 456).

Basca Mfg. Co., 1454 East Nineteenth Street, Indianapolis, manufacturer of metal stampings, automobile mufflers, etc., has purchased former plant of Houdaille-Hershey Corpn., 3019 Roosevelt Avenue, manufacturer of automobile shock absorbers, totaling 100,000 sq. ft. floor space, and will improve for new plant. Present works will be removed to new location and increased capacity carried out. L. L. Swartz is president.

Contracting Officer, Quartermaster Corps, Jeffersonville, Ind., asks bids until Jan. 23 for twist drills, carpenter wrecking bars, cross-cut saws, hand saws, earth tampers and other equipment (Circular 146).

WESTERN PA. DIST.

Board of Education, Franklin, Pa., plans manual training department in new two-story junior and senior high school, for which Laurie & Greene, Harrisburg, Pa., are architects. Fund of $250,000 has been arranged through Federal aid for building and equipment.

Wheeling Steel Corpn., Wheeling, W. Va., has let general contract to S. Malkin Construction Co., Memphis, Tenn., for one-story branch storage and distributing plant at Memphis, 328 x 350 ft. Cost about $100,000 with mechanical-handling, conveying and other equipment. Local offices of company are at 285 West Trigg Street.

City Council, McMechen, W. Va., has called special election on Feb. 1, to vote bonds for new municipal electric light and power plant, for which plans will soon be prepared.

MIDDLE WEST

Federal Pipe & Supply Co., 900 South Campbell Avenue, Chicago, has plans for one-story addition, primarily for storage and distribution. Cost close to $50,000. Graham, Anderson, Probst & White, 80 East Jackson Boulevard, are architects.

South Side Brewing Co., 3700 South Halsted Street, Chicago, has asked bids on general contract for four-story addition for a mechanical bottling works. Cost over $60,000 with machinery. Joseph Bednarik, 1643 Garfield Boulevard, is architect.

Signal Corps Procurement District, 1819 West Pershing Boulevard, Chicago, asks bids until Jan. 14 for guy wire protectors, galvanized pole steps, telephone fuses and other supplies (Circular 29).

Board of Education, International Falls, Minn., plans manual training department in new two-story and basement junior high school, for which bids are being asked on general contract until Jan. 20. Cost about $265,000. Nairne W. Fisher, St. Mary's Building, St. Cloud, Minn., is architect.

United States Property and Disbursing Officer for Nebraska Militia Bureau, Lincoln, Neb., asks bids until Jan. 29 for deep-well turbine pumping equipment, and for gasoline storage tank with pumping unit at Ashland, Neb.

Common Council, Windom, Minn., plans extensions and improvements in municipal electric power plant, including installation of Diesel engine-generator unit with accessory equipment, fuel storage tanks, cooling tower and other equipment. Cost about $100,000. Rose & Harris, Es-

FOR MACHINES

that must not stop . . .

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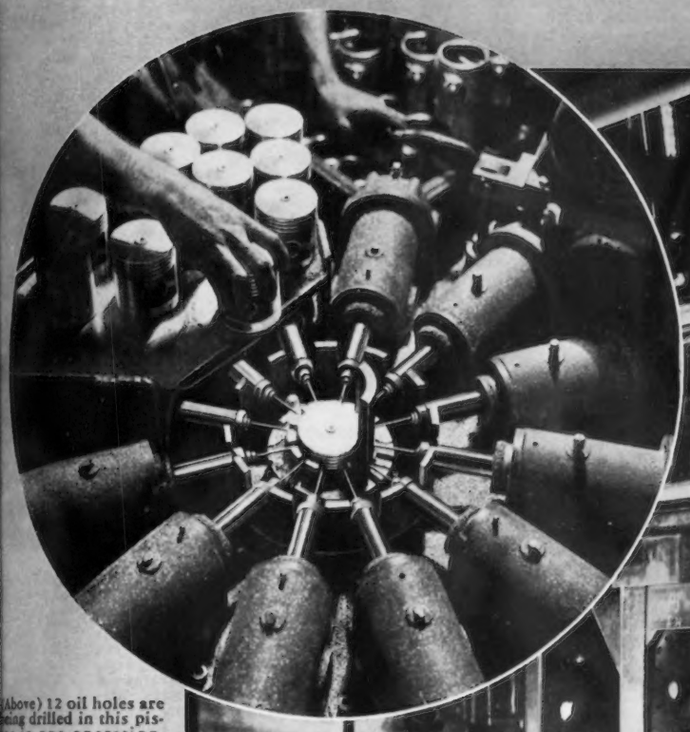

(Above) 12 oil holes are being drilled in this piston in one operation. The use of the right Gulf lubricant helps keep such automobile plant equipment as this in continuous, low cost service.

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sex Building, Minneapolis, Minn., are consulting engineers.

United States Engineer Office, Fort Peck, Mont., asks bids until Jan. 14 for round pin anchor shackles (Circular 248).

Trane Co., La Crosse, Wis., manufacturer of steam and heating specialties, has leased about 20,000 sq. ft. floor space in building at King and Dufferin Streets, Toronto, for expansion in plant of Trane Co. of Canada, Ltd., a subsidiary, 439 King Street West, Toronto. Present works will be removed to new location and additional machinery installed.

Bureau of Reclamation, Denver, asks bids until Jan. 13 for vertical hydraulic self-indicating compression type testing machines, 200,000-lb. capacity, for field laboratory use (Specification 758-D).

MICHIGAN DISTRICT

Fisher Body Corpn., General Motors Building, Detroit, a unit of General Motors Corpn., has plans for new plant on 80-acre tract at Grand Rapids, Mich., recently purchased, for production of dies and automobile body stampings. It will comprise group of one-story units, totaling close to 400,000 sq. ft. floor space, and will be divided into two main departments for manufacture of large steel stamping dies and tools, and for fabricating a complete line of metal panels and other metal parts for automobile bodies respectively. Erection is scheduled to begin soon. Cost over $6,000,000 with machinery. Edward F. Fisher is general manager. D. S. Harder will be manager at new works.

Wayne Screw Products Co., 521 St. Jean Avenue, Detroit, has begun erection of one-story addition, 60 x 140 ft. Cost over $45,000 with equipment. Harry Angell is company architect.

McClanahan Refineries, Inc., St. Louis, Mich., has awarded general contract to Arthur G. McKee & Co., Cleveland, for addition to oil refinery. Cost over $100,000 with equipment.

Consumers Power Co., Jackson, Mich., is arranging program for extensions and improvements in transmission and distributing lines, including power substation and service facilities for rural electrification in different parts of State. Fund of $2,000,000 will be expended.

SOUTHWEST

Griesedieck Brothers Brewery Co., 1920 Shenandoah Avenue, St. Louis, has plans for one-story addition for a mechanical bottling works. Cost over $125,000 with machinery. A. A. Griesedieck is president.

City Council, Marshall, Mo., plans extensions and improvements in municipal electric light and power plant, including equipment. Fund of $158,000 has been arranged through Federal aid. Henrici-Lowry Engineering Co., 114 West Tenth Street, Kansas City, Mo., is consulting engineer.

Ben Sibbet Iron Works, 214 Moore Street, Wichita, Kan., has let general contract to Henrion Improvement Co., 507 North Wabash Avenue, for one-story addition, 40 x 100 ft., primarily for storage and distribution.

Board of Education, El Dorado, Kan., plans manual training department in new three-story and basement high school, for which bids are being asked on general contract until Jan. 15. Cost about $400,000. Thomas W. Williamson & Co., National Bank of Topeka Building, Topeka, Kan., are architects.

Board of Trustees, Lincoln University, Jefferson City, Mo., will soon begin superstructure for two-story and basement mechanical arts building, 64 x 117 ft., for which general contract recently was let to J. E. Williams Construction Co., 6914 Dartmouth Avenue, St. Louis. William B. Ittner, Board of Education Building, St. Louis, is architect.

City Council, Plainview, Tex., has concluded financing through Federal aid for fund of $420,000 for new municipal electric light and power plant. Work will begin soon.

Cook Heat Treating Corpn., 3334 Slauson Avenue, Los Angeles, has let general contract to Samuel D. Cook, 3769 Farbar Street, Houston, Tex., for one-story branch plant on Navigation Boulevard, Houston, where site was recently acquired. Cost about $40,000 with equipment.

WASHINGTON DIST.

Olde Tyme Distillers, Inc., Cedarhurst, Md., has awarded general contract to G. Walter Tovell, Inc., Eutaw and Monument Streets, Baltimore, for five-story addition, 100 x 140 ft., for storage and distribution. Cost over $100,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until Jan. 14 for one automatic band-saw sharpener, 24 machinists' bench vises, 168 monkey wrenches, 72 cross-cut saws, 936 cold chisels, twist drills, auger bits, files, dredge chain, crane chain, clamps, etc. (Schedule 3114); until Jan. 16, one band-saw, one wood-turning lathe, one hand planer and jointer (all motor driven), quantity of refrigerator castings, motor - starting switches, brass screw hooks, toggle or tumbler switches, wire cable, stove wire, machine washers, wood screws, machine screws, steel-wire brushes, 10,000 ft. copper cable, 10,000 ft. tinned copper wire, 3000 ft. power and lighting type cable, and other supplies (Schedule 3116).

Columbia Specialty Co., 1508 East Fayette Street, Baltimore, manufacturer of cans and containers, has plans for one-story addition, 35 x 200 ft., on site recently acquired at 6301 Eastern Avenue. Cost over $40,000 including equipment.

Bureau of Yards and Docks, Navy Department, Washington, closes bids Jan. 22 for combined land plane and sea plane hangar, with reconditioning and repair facilities; electric power plant and distribution system; fresh and salt water supply systems, with pumping machinery and auxiliaries, steel tank, refrigeration plant and other equipment for aviation facilities at St. Thomas, Virgin Islands (Specification 8127).

James Distillery, Inc., 807 Key Highway, Baltimore, has let general contract to State Building Co., Baltimore, for one-story addition. Cost over $25,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 17 for 15,450 ft. brush-holder cable for Eastern and Western, and Mare Island navy yards (Schedule 6906); until Jan. 14, 75 electric air heaters and spare parts for Portsmouth and Mare Island yards (Schedule 6871).

Cavalier Distributing Corpn., Richmond, Va., plans one-story mechanical bottling works at 2100 Westwood Avenue. Cost about $45,000 with equipment.

BUFFALO DISTRICT

Continental Can Co., Inc., East Water Street, Syracuse, N. Y., plans one-story addition to can-making and can-sealing machinery manufacturing division, with additional storage and distributing facilities, on part of 2-acre adjoining tract, acquired several months ago. Cost over $50,000 with equipment. Headquarters are at 1 Pershing Square, New York.

Colonial Radio Corpn., 254 Rano Street, Buffalo, manufacturer of radio equipment and parts, has plans for one and two-story addition, 25 x 100 ft. Cost close to $40,000 with equipment.

Spencer Kellogg & Sons, Inc., Niagara Square, Buffalo, manufacturer of linseed oil products, has engaged William J. Moran, 1011 South Fremont Street, Alhambra, Cal., engineer, to prepare plans for new branch plant on 6-acre tract at Long Beach, Cal., to comprise several units instead of single structure, as recently noted. Main mill will be four stories, 60 x 75 ft., with adjoining four-story refinery, 50 x 60 ft., and power house, 80 x 100 ft.; one-story storage and distributing building and one-story office also will be built. Installation will include hydraulic presses, filter presses, refining machinery, hoists, conveyors, automatic tank scale and special machinery. Cost about $150,000 with equipment. It is planned to build additional units later.

PACIFIC COAST

Douglas Aircraft Co., 3300 Ocean Park Boulevard, Santa Monica, Cal., has asked bids on general contract for new hangar, 285 x 300 ft., and 90 ft. high, with shop and reconditioning facilities, on tract near plant. Cost over $150,000 with equipment. Edward C. Taylor and Ellis W. Taylor, 803 West Third Street, Los Angeles, are architect and engineer respectively.

Joseph Do Gorgio, president, Earl Fruit Co., Lodi, Cal., is at head of project to construct a local winery, comprising several one-story units, with storage and distribution facilities. Cost over $85,000 with equipment.

National Dry Ice Corpn., 122½ South Vermont Avenue, Los Angeles, plans new one-story dry ice manufacturing plant at Niland, Cal. Cost over $50,000 with equipment. Thomas B. Slate is company engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 14 for one drill press (Schedule 6892), one crucible tilting furnace (Schedule 6884), and one motor-driven precision bench lathe (Schedule 6885) for San Diego Naval Station; one sheet metal-working brake machine (Schedule 6889) for Mare Island yard; 14 armatures, 140 electric fans, 14 sets field coils and 14 control unit assemblies (Schedule 6881) for Puget Sound yard.

Northwest Door Co., 1203 East D Street, Tacoma, Wash., has acquired property in Tideland Industrial Area as site for new one-story, sawtooth roof plant, 180 x 216 ft., for manufacture of millwork products. General contract has been let to N. S. Nelson & Son, Provident Building. Cost over $50,000 with machinery, conveyors and other mechanical-handling equipment. Russell, Lance & Muri, 319 South Seventh Street, are architects.

Goleta Citrus Growers' Association, Santa Barbara, Cal., care of W. W. Ache, 301 North Citrus Avenue, Los Angeles, architect, has let general contract to Clyde Jones, Upland, Cal., for new one and two-story packing plant, T-shaped, 120 x 300 ft. Cost about $75,000 with mechanical-handling, air-conditioning and other equipment.

Bellingham Brewing & Malting Co., Bellingham, Wash., plans new three-story brewery on Marietta Road, where site has been selected. Cost over $125,000 with machinery. Carl Linde, Bellingham, is architect.

FOREIGN

Morris Commercial Cars, Ltd., Birmingham, England, manufacturer of commercial automobiles and parts, plans one-story addition on adjoining site, totaling about 150,000 sq. ft. floor space. It is scheduled for completion next spring and will provide facilities for about 1500 additional operatives. Cost close to $1,200,000 with equipment.

Ontario Paper Co., Ltd., Thorold, Ont., plans new pulp and newsprint mill on Comeau Bay, near Rimouski, Que., comprising several large units. Company will also develop water power project for service at new plant. Entire project will cost close to $7,500,000 with machinery. Plans have been approved for new steam-electric power plant at present mill at Thorold, to cost about $1,000,000 with equipment. J. T. Jaeger is chief engineer.

American Steel Foundries, in three months ended Sept. 30, had net loss of $40,501 compared with net profit of $179,583 in the September quarter last year. For the nine months ended Sept. 30 net loss was $313,141, against a net profit of $431,401 in the like period of 1934.

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Bell System Teletypewriter Service is rapidly revising the office practice of American business—effecting immediate economies—improving customer service—simplifying the control of separated units.

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Fast, smooth order-handling levels off production and shipping peaks, speeds up deliveries and collections, reduces inventories. All necessary forms are prepared simultaneously at the separate offices in a single operation—which saves errors, recopying, rechecking, and frees clerical personnel for other duties.

Big and little businesses have proved that teletypewriter service more than pays for itself. Your local Bell Company will be glad to discuss its possible application to *your* business. Just call the Business Office. No obligation, of course.

NEW TRADE PUBLICATIONS

Chaplets.—Angell Nail & Chaplet Co., 4580 East Seventy-first Street, Cleveland. Folder. Presents a mechanical analysis of the merits of an improved pressure proof chaplet and the particulars of its use.

Stoker. — Combustion Engineering Co., Inc., 200 Madison Avenue, New York. Folder. Describes and illustrates the company's "M.R.O." multiple-retort stoker. Test data and operating results are tabulated.

Supplies.—Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. General catalog, second edition. Covers belting, hose, packing, molded goods, friction material, rubber coverings, abrasive wheels, etc.

Air-Lift. — Ingersoll-Rand Co., Phillipsburg, N. J. Bulletin No. 9042, 24 pages. Sets forth in detail the theory of air-lift pumping. Illustrates with cuts of installations, present data for calculations and tabulates capacities under varying conditions.

Ball Bearings.—S. K. F. Industries, Inc., Front Street and Erie Avenue, Philadelphia. Bulletin. Devoted to replacement of plain bearings, as employed for fans and blowers, with ball bearing assemblies and housings.

Contractors.—Electric Controller & Mfg. Co., Cleveland. Bulletins. New "Line-Arc" and "L.T.Z." contractors for direct and alternating currents respectively. Detailed description of this company's new design for secientific control of the arc.

Electric Tools.—Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago. Catalog No. 60. Descriptive of the entire "Thor" line of high frequency electric tools, including drills, drill stands, screw drivers, nut setters, tappers and stud setters, grinders, sanders, rubbers, polishers and balancers. Separate section devoted to universal electric tools, pneumatic and contractors tools.

Couplings.—Charles Bond Co., 617 Arch Street, Philadelphia. Bulletin. Covers recently patented features of "Bondtru" flexible insulated couplings and supplies details of assembly and installation.

Portable Tools.—Skilsaw, Inc., 3310 Elston Avenue, Chicago. Catalog. Portable tools for production, maintenance and construction. Action illustrations showing proper use. Line includes hand saws, drills, belt sanders, cleaners, buffers and grinders. Specifications given for both tools and accessories together with tabulated electrical information.

Dredging Pumps.—Lawrence Machine & Pump Corpn., Lawrence, Mass. Bulletin. Describes pumps designed for general dredging purposes and includes tables giving capacities, speeds and power requirements for different sizes at various heads.

Steel Sheets.—Superior Sheet Steel Co., Canton, Ohio. Catalog. Filled with suggestive illustrations of sheet steel use. Describes in detail Superior "Galvannealed" sheets and points to particular services rendered by the product.

Unit Heaters.—L. J. Wing Mfg. Co., 154 West Fourteenth Street, New York. Bulletin. Illustrations of construction and assembly, installation cuts together with line drawings and tabulated engineering data.

Wire Rope. — Macwhyte Co., Kenosha, Wis. General catalog. Spiral bound compilation of detailed information in compact form. Illustrations of construction, tables of strand type with engineering data, and sections on fittings and rope lubrication.

Friction Materials.—Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. Catalog. Details types of "Condor" asbestos friction materials for industrial uses; supplies technical data on each type and presents engineering tabulations for industrial calculations.

Grinders. — Cleveland Pneumatic Tool Co., 3734 East Seventy-eighth Street, Cleveland. Bulletin. Pictures the various types of rotary grinders manufactured by the company, presents a master blueprint of design features and specifies characteristics and capacities of each tool.

Toolroom Saw. — Continental Machine Specialties, Minneapolis, Minn. Catalog. "Do-All" internal and external sawing and filing machine. Description of equipment, complete with brazing unit, for continuous operation on die and toolroom work. Details of construction and design; illustrations of operating technique.

Grinders.—United States Electrical Tool Co., Cincinnati. Folder. Description of adjustable speed, alternating current grinders for vitrified and high-speed wheels. Includes details of patented gear drive transmission and tables of specifications.

Grinders.—Baldor Electric Co., St. Louis, Mo. Folder. Presents particulars of bench and pedestal grinders in wheel capacities from 6 to 12 in., and having power requirements from ⅓ to 3 hp. Specifications are given on a new 12-in. size.

Dippers.—American Manganese Steel Co., Chicago Heights, Ill. Folder. Describes and pictures the different design elements of a new manganese steel renewable lip dipper for use on construction work and in material digging and handling.

Conveyors.—Robins Conveying Belt Co., Mead-Morrison Division, Fifteen Park Row, New York. Folder. Gives diagrams of an improved pivoted overlapping bucket conveyor and outlines arrangements for the handling of various materials under varied conditions.

Wheel Dresser.—J. K. Smith & Sons., Inc., 157 Chambers Street, New York. Folder. Presents details of a water cooling method employed in keeping mounted industrial diamonds and holders cool.

Diesel Locomotives. — Euclid Road Machinery Co., Cleveland. Bulletin. General description and specifications of standardized Diesel electric industrial locomotives. Details of power application and tables of drawbar pulls.

Converters.—Janette Mfg. Co., 556 West Monroe Street, Chicago. Bulletin. General operating information on rotary converters having built-in capacities from 110 to 3500 volt amps., one, three and four phase for high or low power factor transformers.

Conveyors. — Standard Conveyor Co., North St. Paul, Minn. Catalog. Two editions—general catalog of 40 pages, and 56 pages of detailed drawings, descriptions and illustrations; the latter particularly for engineers.

Turret Lathes.—Millholland Sales & Machine Co., Indianapolis, Ind. Bulletins. Present details of the company's turret lathes and lathe tools.

Vacuum Pumps.—Pennsylvania Pump & Compressor Co., Easton, Pa. Bulletin. Gives details and features of single stage and two stage horizontal roller bearing type, air cushion valve vacuum pumps. Illustrations, diagrams and sectional views.

Electric Melting. — Detroit Electric Furnace Co., Detroit. Handbook and catalog on foundry and high temperature process melting, discussed both from standpoint of foundries and public utilities. Value of indirect arc rocking principle is featured as means of better metallurgical control, greater flexibility in changing analyses and higher superheat temperatures. Cooperative section contains information on accessories and supplies needed for electric melting.

Prefabricated Houses.—Insulated Steel Construction Co., Middletown, Ohio. Illustrated folder, describing prefabricated steel houses of frameless construction. Plans of eight typical designs are sketched, but there are so many possible variations that homes may be practically custom-built. Details of construction and advantages of metal houses are described.

Centrifugal Pumps. — Morris Machine Works, Baldwinsville, N. Y. Bulletin No. 157, 16 pages, describing and illustrating single- and multi-stage horizontally-split units, non-clogging, slurry and sludge, sand dredging and other pumps. Hydraulic dredges and steam engines made by the company are also illustrated.

Agitating and Mixing Equipment.—Patterson Foundry & Machine Co., East Liverpool, Ohio. Catalog No. 355, 34 pages. This describes and illustrates line of agitating, mixing, crushing and grinding equipment for use in chemical, food, paint and other industries, and pebble mills for dry and wet grinding and mixing. Patterson horizontal Unipower drive and new type of speed reducer are also described.

Special Machinery. — Adamson Machine Co., Akron, Ohio. Folder supplemental to Catalog No. 66. This describes and illustrates hydraulic presses, vulcanizers, extruding machines, electrically heated platen presses and other equipment used in the rubber, plastic molding and other industries.